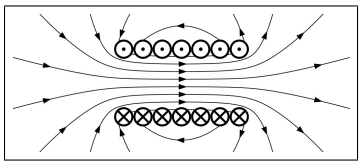
Physics 133 Sections 3 & 4
Physics II: Electricity, Magnetism, and Waves
Lafayette College
Fall 2020
Prof. David Nice



Remote Teaching Preface

This semester is the first-ever attempt to run remote courses for a full semester at Lafayette. This is a necessary response to the Covid-19 crisis. I will work hard to bring you the best possible learning experience under this circumstance. This syllabus lays out my expectations as the semester begins. Over time, as we undertake remote teaching, and as we learn from the experience, there will surely be things that evolve from the expectations laid out here. I will strive for clear communications about all aspects of the course and its policies over the semester. Please have patience and understanding. Please communicate with me if anything about the course is unclear, or anything about the course format impedes your ability to learn.

I love teaching introductory physics, and I am excited to be leading this class. The material will be challenging, but it will be rewarding. Welcome aboard!

What This Course Is About

From the catalog: "This course is a rigorous calculus-based introduction to the foundations of electricity, magnetism, and waves, 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."

The theory of electromagnetism is a unified framework that explains electric and magnetic forces as well as the interrelation between these two types of forces. There are three reasons that electromagnetism is studied at this point in the physics curriculum:

- Electromagnetism is one of the *four fundamental forces of nature* (along with gravitation, the weak force, and the strong force). Thus it is of intrinsic interest. Further, electromagnetism and gravity are the only two of these forces which have effects which you can see with your own eyes. This makes them the natural subjects of any introductory physics sequence.
- Electromagnetism is all about *fields*. The mathematical and physical techniques used to study electromagnetism can be extended to analyze all other physical forces. It is no exaggeration to say that fields underlie nearly all modern work in fundamental physics.
- Electromagnetism gives rise to a host of interesting phenomena. Examples of natural phenomena that arise from electromagnetism are radio waves, light, X-rays, lightning, geomagnetism, and human eyesight. Electromagnetism permeates modern technology, and is fundamental to such things as electric circuits, video displays, wireless telecommunications, radar, artificial lighting. motors, and generators.

Instructor Contact Information

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Class Meetings

Section 3: Monday, Wednesday, Friday; 10:00-10:50 Eastern Time
Section 4: Monday, Wednesday, Friday; 2:10-3:00 Eastern Time

We will meet via Zoom: https://lafayette.zoom.us/j/98982144923
See the end of this document for additional connection methods.

Class Format

We will meet synchronously at scheduled class times. Classes will be recorded for viewing by students who have time zone issues or who want to re-watch part of the class.

We will take an approach somewhere between traditional class/lecture and a "flipped classroom." For a typical class, there will be a couple short videos for you to watch beforehand. Class time will be a mix of instruction and group problem solving.

There will be a daily handout for each class that lists problems to be work, topics to be discussed, etc. I will distribute these via E-mail before class, and I will post them on Moodle.

Links to videos will be posted on Moodle.

During class, I will use an iPad to act as a whiteboard. Copies of the whiteboard work will be posted on Moodle after class.

Website

Handouts, homework assignments, video links, etc., will be distributed via Moodle.

Office Hours

I will have weekly office hours. The schedule will be set shortly after the semester begins and will be posted on Moodle. During office hours, I will closely monitor E-mail. Send me a message and we can then meet via zoom.

Office hours are a great time to stop by for questions about course material, homework problems, or anything else related to the class.

If you wish to meet outside of scheduled office hours, E-mail me to schedule an appointment.

Supplemental Instruction

We will have weekly student-led supplemental instruction (SI) sessions and office hours. These are great places to shore up your understanding of the material and to get help. Details will be announced in class and posted on Moodle.

Text

We will use the following text. This is the same text used for Physics 131.

- Young and Freedman, "University Physics with Modern Physics MasteringPhysics," 14^{th} edition. ISBN 9780321982582.

We will use the on-line MasteringPhysics system for some homework problems. This comes bundled with the text or can be purchased separately. See the Homework section of this syllabus for further MasteringPhysics information.

Make sure you get fourteenth edition of the textbook.

While the text will serve as an important resource, classes and homework sets will be your primary guide to what you need to know in order to do well in this course. Skim through the assigned sections of the text, but read through the examples carefully. Use the text as a reference as you work homework problems and study for exams.

Homework

Homework is the heart of this course. You don't learn physics by reading about it, or by hearing lectures about it, or by watching someone else do it. You learn it by doing it yourself: doing real experiments in lab and doing real calculations in homework.

There will be weekly homework assignments. Each assignment will include a pencil-and-paper component, to be uploaded to Moodle, and an on-line component, using MasteringPhysics.

Detailed instructions for accessing MasteringPhysics are on Moodle. The key information is:

Website:	https://www.pearson.com/mastering
Course ID:	nice53075
Course name:	PHYS 133: Physics II: Electricity, Magnetism, and Waves

Homework will be due at 5:00 p.m. Fridays.

Late papers will be accepted for 50% credit through 5:00 p.m. on Mondays. Late on-line homework will accepted up to 72 hours after the due time, and will be penalized using a sliding scale. If you cannot complete an assignment due to illness, family emergency, or similarly compelling reason, please contact me. (Also see the "Dean's excuse policy" in the Student Handbook.)

I *strongly* encourage you to work with other students on the homework. Try the problems yourself. When you get stuck, talk to someone else about them. Physics is hard. You won't get all the problems on your own. Working in groups is a powerful way to learn. It is also more fun.

Please make use of office hours if you are having difficulty on homework. I am happy to help. Often there will be other students there with questions similar to yours. I expect that most of you will take advantage of office hours sooner or later during the semester.

Exams

There will be three exams:

- Exam #1. Friday, September 18
- Exam #2. Friday, October 30
- Exam #3. Finals Week.

Each exam will be on the material covered in the preceding weeks of class (i.e., since the previous exam). Details will be given before each exam. There will *not* be a comprehensive final exam. The third exam, given during finals week, will focus on material from the last weeks of the semester.

Details of exam structure and logistics will be given at least one week in advance of each exam.

Labs

Labs are an essential part of the course. You will work on virtual experiments that are closely correlated with the material we cover in class. Details will be given elsewhere.

Class participation

Course grades will include a participation component. Initially, this will be based on class attendance and viewing of class videos as recorded in computer logs. Students who cannot make scheduled class times due to severe time zone issues will be accommodated.

Details of the participation grade may be modified as the semester evolves to adapt to any changes in the course structure.

Grading

There must be grades. Your grade will be based on:

Participation	10.000%
Homework	20.000%
Lab	15.000%
Exam #1	18.333%
Exam #2	18.333%
Exam #3	18.333%

I will post homework and exam grades on Moodle. Exam grades may be re-scaled depending on the difficulty of the exam. I will use the following numerical score when setting letter grades:

A	92.500 and higher	B−	79.500−82.499	D+	66.500−69.499
A−	89.500−92.499	C+	76.500−79.499	D	62.500−66.499
B+	86.500−89.499	C	72.500−76.499	D−	59.500−62.499
B	82.500−86.499	C−	69.500−72.499	F	59.499 and below

Other Sections of Physics 133

There are four sections of Physics 133 taught this semester, taught by three different professors. Topic coverage will be similar between the sections, and students in all sections will have the same labs. Homework and exams will differ, and course policies and teaching styles may vary between sections. Those of us teaching the course will work hard to ensure that grading and workload are equitable across all four sections.

Prerequisites

Physics 131 or 151 (Physics I) is a prerequisite of this course. You should have an understanding of mechanics fundamentals such as forces, energy, vectors, units, etc.

Math 162 (Calculus II) is a prerequisite of this course. You should understand the fundamental ideas of calculus, and you should have a working knowledge of derivatives and integrals of polynomials, basic trigonometric functions, exponents, and logarithms.

Course Goals and Topic Coverage

The goals of this course are to teach you to *think like a physicist* and to provide a foundation for further study in physical science and engineering. We will accomplish this by introducing you to the following topics. This list may evolve as the semester progresses. Specific topic and text coverage will be given on a weekly basis on the homework assignments.

Topic	Text Chapter(s)	Approximate number of class sessions
Electric fields	21	4
Gauss's law	22	3
Electric potential	23	3
Capacitance	24	2
Current & resistance	25	2
Direct-current circuits	26	4
Magnetic forces	27	2
Magnetic fields	28	3
Induction & inductors	29,30	4
Waves (review)	15,16	4
Electromagnetic waves	32	3
Propagation of light	33	2
Interference	35,36	2
Exam days during the semester		2
Catch-up days		2

Outcomes

After completing this course, you will be able to understand, identify, and apply the fundamental principles of physics in a variety of physical situations. You will be able to use both qualitative reasoning and quantitative problem-solving skills in applying those principles. Among other things, you will be able to:

- Calculate the electric and magnetic field patterns in response to a variety of sources.
- Analyze the behavior of particles in response to electric and magnetic fields.
- Understand the connection between potentials, fields, and sources.
- Understand the interrelation of electric and magnetic fields through Maxwell's equations.
- Analyze electrical circuits.
- Analyze the behavior of systems exhibiting interference.

Within the Lafayette Common Course of Study, this course (particularly the lab component) will promote the following outcomes for Natural Sciences:

- NS1. 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.

Whom we root for (since there are no Patriot League sports this semester)

We root for the Philadelphia Eagles. In emergency situations, when the Philadelphia Eagles are not available to be rooted for, we root for the Green Bay Packers.

Intellectual Honesty

You are expected to abide by the principles of intellectual honesty outlined in the Lafayette Student Handbook available at http://conduct.lafayette.edu.

Learning is a collaborative process, I encourage you to discuss and collaborate with other students on homework. "Collaboration" does not mean "copying." You must understand and individually write out your answer to each problem.

Exams must be done on your own, using only materials specifically allowed.

Accommodation

My policy. It is important to me that you do well in this class. 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.

Mandatory Credit Hour Statement

The student work in this course is in full compliance with the federal definition of a four credit hour course.

Zoom

Meeting link:	https://lafayette.zoom.us/j/98982144923
Meeting ID:	989 8214 4923
One tap mobile:	+13126266799,,98982144923# US (Chicago) +16468769923,,98982144923# US (New York)
Alternate numbers:	+1 312 626 6799 US (Chicago) +1 646 876 9923 US (New York) +1 301 715 8592 US (Germantown) +1 346 248 7799 US (Houston) +1 669 900 6833 US (San Jose) +1 253 215 8782 US (Tacoma)
Additional numbers:	https://lafayette.zoom.us/u/dxcpQZyyx
Skype for business:	https://lafayette.zoom.us/skype/98982144923