Physics II: Electricity, Magnetism and Waves

PHYS133, Section 3 (10 am), Fall 2022

Overview and basic info

Course info

Classroom: Hugel 100
Time: 10:00-10:50am MWF
Textbook: *University Physics with Modern Physics*, 15th ed. by Young and Freedman
with Modified Mastering Physics
Prerequisites: PHYS 131 or PHYS 151, MATH 162 or permission of instructor

Office Hours (*TENTATIVE*):
MWF 11:00-11:30am (Hugel 022)
MWF 2:00-2:30pm (Hugel 142)
T 1:30-3:00pm (Hugel 142) - subject to change!

Homework due Wednesdays at 5pm

Instructor

Dr. Stephanie Douglas
Please call me "Professor Douglas" or "Doctor Douglas" or "Professor"
My pronouns are she/her/hers
Email: douglste@lafayette.edu

How to get help for this class

Physics is hard, but you aren't alone! **Science is a social enterprise. Work with your peers, the supplemental instructors (SIs), and me if you're having trouble (and even if you're not).**

I encourage you to collaborate with your peers on homework, in-class activities, labs, studying, etc. Note that "collaboration" does not mean "copying." You must understand and individually write out your own answers, and you must turn in your own copy of each assignment.

Contact and office hours

Open drop-in "contact" or "office" hours are listed at the beginning of the syllabus. If you would prefer to meet virtually, I will also keep a Zoom link open - see Moodle for the link.

I also have blocks of time each week for one-on-one or small group meetings; if these times don't work for you, please email me. Meetings will be virtual unless we both confirm otherwise.

I will generally check email between 10-6 on weekdays, and will reply by the end of the next weekday. I will sometimes check email at other times, but this is not guaranteed.

I expect you to check email (and read any announcements) at least once between each class.

Supplemental Instruction

SIs hold 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.

Course Policies

Attendance required

This class will be taught in person. **Attendance is mandatory** and you should **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. **See the "Attendance" grading section for details.**

Your health is always paramount, but even more so this semester. **Please do not attend class if you are experiencing COVID-19 symptoms: contact Bailey's for a Dean's Excuse.**

If you will miss class or an assignment deadline due to a religious holiday, please contact me by the add/drop deadline so that we can make plans for you to complete the relevant work.

Masks required

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, masks must be worn during classes and labs. Masks should be made of a tightly woven cloth or non-woven synthetic filtering material, and should be worn properly over the nose and mouth and secured on the chin (CDC mask recommendations). Food and drink must also be consumed 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 help you obtain one.

Contingency plan for virtual meetings

Ideally we will be able to maintain in-person classes this semester. However, COVID-19 or weather may temporarily require us to switch to Zoom meetings. I will let you know as far in advance as possible if this is necessary. The Zoom link will be posted to Moodle.

Hopefully we're all familiar with virtual class etiquette by now. Mute your mic when you're not speaking, raise your hand physically or virtually to speak, be polite in the chat, etc. I would appreciate it if you keep your cameras on - if this isn't possible, please set up an appropriate profile picture so that I'm at least not talking to blank squares.

Accomodations: talk to me by the add-drop deadline

My policy: Your success in this class is important to me. If you need accommodations for any reason, please speak with me privately ASAP to discuss reasonable accommodations. I am happy to consider creative solutions as long as they do not compromise the learning goals of the activity. **However, formal documentation is required for any testing accommodations.**

Mandatory statement for any Lafayette course with a disability policy: Lafayette College is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any barriers to learning in this course, you are welcome to discuss your concerns with me. If you have a disability, or think you may have a disability, please meet with the Office of Accessibility Services, to begin this conversation or request an official accommodation. If you have already been approved for accommodations through the Office of Accessibility Services, please meet with me so we can develop an implementation plan together.

Collaboration and Plagiarism: work together, submit your own work

You are expected to abide by the principles of intellectual honesty outlined in the Lafayette College Student Handbook. All answers must be given in your own words, not copied from the textbook or any other resources. Copying solutions from another source is a violation of the Academic Integrity Policy. This includes Chegg, Bartleby, CourseHero, or similar websites; instructor/publisher solutions; the work of past students; or anything you can find on Google.

Evidence of plagiarism will yield a reduced or zero grade for the assignment at the discretion of the instructor, and may be reported to the College.

Commitment to Inclusion and Equity

Lafayette College is committed to creating a diverse community: one that is inclusive and responsive, and is supportive of each and all of its faculty, students, and staff. The College seeks to promote diversity in its many manifestations. These include but are not limited to race, ethnicity, socioeconomic status, gender, gender identity, sexual orientation, religion, disability, and place of origin. The College recognizes that we live in an increasingly interconnected, globalized world, and that students benefit from learning in educational and social contexts in

which there are participants from all manner of backgrounds. The goal is to encourage students to consider diverse experiences and perspectives throughout their lives. All members of the College community share a responsibility for creating, maintaining, and developing a learning environment in which difference is valued, equity is sought, and inclusiveness is practiced.

If you are experiencing discrimination or harrassment in this class, please do not hesitate to reach out to me so that I can help resolve the issue.

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 listed on the roster**, just let me know.

Do not repost learning materials, do not create your own class recordings

All course materials are proprietary and for class purposes only. This includes posted recordings of lectures, worksheets, discussion prompts, and other course items. Such materials should not be reposted, and should be deleted at the end of the semester. Online discussions should also remain private and not be shared outside of the course. If you have any questions about proper usage of course materials feel free to ask me. You may not record classes yourself.

Assignments and grading

Unless otherwise noted, all assignments must either be completed entirely within Moodle or Norton Smartwork. Submissions to Moodle must be uploaded as PDF files or Kaltura video submissions. Work that is uploaded as an image straight from your camera will not be graded.

Course Grade Components

Attendance: 10%
Labs: 15%
Problem Sets: 20%
Midterm exams*: 3 x 13.75%
Final exam (2 “units”)*: 27.5%
* lowest exam “unit” will be dropped

Time bank: Three 48-hour free passes to extend deadlines

Over the course of the semester, you will have three 48-hour passes that you can use to extend deadlines for problem sets, no questions asked. You may combine passes on a single assignment, but you may not subdivide the 48-hour increments. **To use a pass, you must email me.**

Attendance (10%)

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.

Each unexcused absence will reduce your final grade by 0.5%. Each late arrival will reduce your final grade by 0.25%. If you lose 10% of your final grade by this mechanism, you will fail the course.

You will have 6 "attendance credits" for the semester: an unexcused absence will use up 2 attendance credits, and a late arrival will use up 1 credit. Once you have exhausted these credits, you will begin losing points for absences/late arrivals.

For example, if you have 2 unexcused absences and 2 late arrivals across the whole semester, you will still receive full marks for attendance. However, if you have 22 unexcused absences, you will not be able to miss any more classes (unexcused) without failing the course.

Laboratory (15%)

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 (20%)

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

Exams (3 x 13.75% + 27.5%; lowest "unit" dropped)

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.

The lowest exam "unit" will be dropped (1 midterm exam or ½ of the final exam). **You must take all the exams.** If you miss an exam, you will receive a 0 and that grade will NOT be dropped.

More about homework

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 will 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 on 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 promise this type of careful problem-solving 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.

Course Outcomes

This course will promote the outcomes from the Natural Sciences section of the Common Course of Study. You will be able to...

- NS 1: Employ the fundamental elements of the scientific method in the physical and natural world by identifying and evaluating a testable scientific hypothesis.

- NS 2: Create and evaluate descriptions and representations of scientific data via equations, graphs, tables, and/or models.

Mandatory credit hour statement

The 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 for the full policy statement.

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.

Planned course schedule (subject to change)

Week	Date	Topic	Reading	Other notes
1	**Aug 29**	Coulomb's Law	21.1-3	
	Aug 31	Electric Fields	21.4-5	
	Sept 2	Continuous Charge Distributions	21.6-7	
2	**Sept 5**	Electric Flux	22.1-2	
	Sept 7	Gauss's Law	22.3	PS 1 due
	Sept 9	Applications of Gauss's Law	22.4-5	
3	**Sept 12**	Electrostatic Potential Energy	23.1-2	
	Sept 14	Electric Potential	23.3	PS 2 due
	Sept 16	Equipotential Surfaces	23.4-5	
4	**Sept 19**	Capacitance	24.1, 3-5	
	Sept 21	Capacitors in Series and Parallel	24.2	PS 3 due
	Sept 23	**Exam I**	**Ch 21-23**	
5	**Sept 26**	Electric Field Energy	24.3-5	
	Sept 28	Electric Current, Resistivity, & Resistance	25.1-3, 26.1	PS 4 due
	Sept 30	Ohm's Law and Electromotive Force	25.3-4	
6	**Oct 3**	Energy and Power in Circuits	25.5-6	
	Oct 5	Kirchhoff's Rules	26.1-2	PS 5 due
	Oct 7	RC Circuits	26.4	
7	**Oct 10**			Fall Break
	Oct 12	Magnetic Fields	27.1-3	PS 6 due
	Oct 14	**Exam II**	**Ch 24-26**	
8	**Oct 17**	Magnetic Forces on Charges	27.4-5	
	Oct 19	Magnetic Forces on Currents	27.6-8	PS 7 due
	Oct 21	Bio-Savart Law		
9	**Oct 24**	Ampère's Law	28.5-6	
	Oct 26	Applications of Ampère's Law	28.7	PS 8 due

	Oct 28	Faraday's Law and Lenz's Law	29.1-4	
10	**Oct 31**	Induction and Maxwell's Equations	29.5-7	
	Nov 2	Inductance and Magnetic Field Energy	30.1-3	PS 9 due
	Nov 4	RL, LC, and RLC Circuits	30.4-5	
11	**Nov 7**	Mechanical Waves	15.1-5	
	Nov 9	Superposition	15.6-8	PS 10 due
	Nov 11	**Exam III**	**Ch 27-30**	
12	**Nov 14**	Sound Waves	16.1-4	
	Nov 16	Resonance	16.5-7	PS 11 due
	Nov 18	Electromagnetic Waves	32.1-3	
13	**Nov 21**	Energy in EM Waves	32.4-5	
	Nov 23			Break
	Nov 25			Break
14	**Nov 28**	Reflection and Refraction	33.1-3	
	Nov 30	Polarization and Scattering	33.4-7	PS 12 due
	Dec 2	Interference	35.1-2	
15	**Dec 5**	Thin Film Interference	35.4	
	Dec 7	Diffraction	36.1-4	
	Dec 9	Diffraction Gratings and Circular Apertures	26.5-7	PS 13 due
16		Reading Days		
		Final exam (comprehensive) scheduled by the registrar		