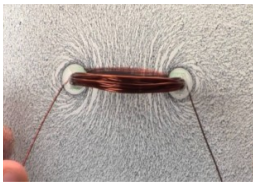
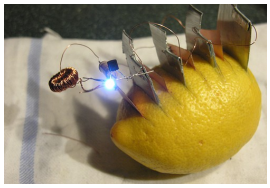
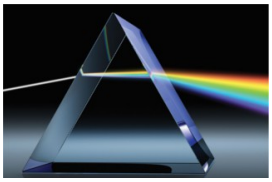
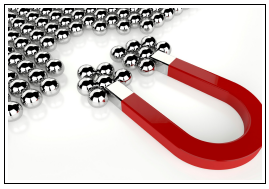
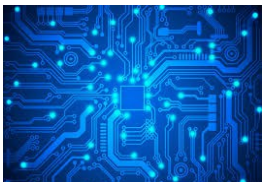





Physics 133
Physics II: Electricity, Magnetism, and Waves

Fall Semester, 2016

Instructor:

Brooks Thomas
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Office: Hugel 020
Phone: (610) 330-5207

General Course Information

This is the second course in a two-semester introductory sequence in physics intended for students majoring in the natural sciences or engineering. In this course, we will focus on electricity, magnetism, and wave phenomena. Together with gravity, these fundamental principles give rise to practically every phenomenon we encounter in astronomy, biology, chemistry, engineering, and medicine – from the color of the sky at sunset to the structure of your own DNA. The understanding that you take away from this course will therefore not only give you provide you with a deeper understanding of these other subjects, but also give you a deeper appreciation for how the things we observe in nature and in our daily lives work at the most basic level.

In the process of coming to that understanding, you'll get a chance to hone some of the universal skills that are crucial in practically *any* science or engineering field – skills such as setting up an experiment, thinking critically about what you observe, reasoning through problems, and communicating your own knowledge to others. Indeed, by the end of the semester, you will be able to understand and apply the fundamental principles of physics – and especially the principles of electricity and magnetism which follow from Maxwell's equations and the principles of wave mechanics – in a variety of physical situations. You will be able not only to apply both qualitative- and quantitative-reasoning skills toward solving concrete

problems, but also to communicate the reasoning behind your solutions to others. You will be able to propose and perform experimental measurements relevant for testing a hypothesis. Moreover, you will be able to assess quantitatively the uncertainty in those measurements and to evaluate whether your data supports, refutes, or motivates the revision of that hypothesis. You will be able to interpret, create, and describe graphical representations of physical data. You will also be able to distinguish between scientifically testable ideas and opinion.

The prerequisites for this course include Physics 131 or 151 and an understanding of calculus at the level of Math 162, as well as basic algebra and geometry. You should be aware that calculus is an integral part of this course (no pun intended), and that a solid grasp of these mathematical prerequisites is assumed. Understanding this background material will be your responsibility, and if you don't feel comfortable with this material, it's up to you to seek help from the instructors or from elsewhere.

I ask that you join this course with a will to think, to ask questions, to make mistakes, and to try out ideas. Be careful not to confuse understanding with having memorized a lot of facts and formulas. I feel that the former is important while the latter is not – and the former will be far more useful to you in the long run.

Components of the Course

The course will consist of class meetings, reading assignments in the text, some questions and problems, some laboratory experience, three mid-term exams, and a final exam. These are described more fully below.

Class Meetings:

Class meetings will be held **from 10:00 AM – 10:50 AM in Hugel 100** each Monday, Wednesday, and Friday during the semester. A schedule of the topics we'll be discussing at each class meeting, along with the corresponding reading assignments, can be found on the course web page. These class meetings are there to help clarify things that you might be confused about after exerting your best efforts at understanding them on your own. However, I emphasize that **not everything can be covered in class; you are responsible for understanding much of the material on your own** by synthesizing what you've learned from your readings, problem sets, lab experiments, exams, and other class activities. It is therefore important that you come to class prepared to ask questions. There are no "dumb" ones. If you don't understand something, chances are there are others who don't understand either or who don't even realize they are missing something.

Class meetings aren't only about lectures either: on most days, we will also have other class activities that are meant to help you understand the material. For example, during class meetings, you will often be working collaboratively in teams of two or three people to come up with solutions to more open-ended problems, such as evaluating a set of proposals for a hydroelectric plant or optimizing the design for a circuit. These kinds of activities are designed provide you with an opportunity to apply what you're learning in ways that more authentically mirror how practicing scientists and engineers actually work. Moreover, it is not unusual for test questions to be based on these activities, so make sure you understand them. For all of these reasons, **regular attendance in class is expected**. You are responsible for knowing anything covered in class, even if you have to miss class for any reason.

Readings:

The required textbook for this course is

- Hugh D. Young and Roger A Freedman, *University Physics with Modern Physics with MasteringPhysics,* 14th Ed. (Pearson, 2015).

Readings from the textbook will be assigned for each class meeting, and it is important to do the assigned reading before class. You can't speed-read this stuff; you should go through it with pencil and paper at hand, checking it out as you go.

In addition to the textbook, you will also need to acquire the following supplementary materials for this course:

- **The Physics 133 laboratory manual**, which is available at the Lafayette College Store in the Farinon College Center.
- **An access code for MasteringPhysics**. If you purchase the textbook new from the Lafayette College Store, you will automatically be given an access code. If you choose to acquire the textbook in another way, you may purchase an access code online from Pearson Publishing at http://www.masteringphysics.com/.
- **A lab notebook**. Please note the your lab notebook for this course must be one of the black, bound lab notebooks available from the Lafayette Bookstore. You and your lab partner will be sharing a single lab notebook, so you should coordinate this purchase with your lab partner.

Homework Assignments:

Homework assignments for this course will include both online exercises from MasterinPhysics and problem sets that you are to submit on paper. A list of the problems included in each homework assignment will be accessible from the course web page. **All problems are due at 4:00 PM on the day (typically a Friday) indicated on the course schedule** on that same web page. Since we will frequently discuss homework during the subsequent class meeting, late homework will not be accepted.

Working through problems accomplishes a lot of different things: it gives you practice using the physical principles you're studying, which helps you learn them in a way simple memorization doesn't; it can show you some further interesting consequences of the fundamental ideas; it will teach you how to approach problems; and it will help you discover how well you really understand what you have read. It is essential that you read the relevant sections of the textbook and review your lecture notes thoroughly *before* attempting the homework problems.

Almost all the physics in a problem comes at the beginning, in the process of setting up the problem – you need to understand the physical principles that apply prior to solving the problem. This means you need to think about the physics, not search for the "right equation" – often there *is* no "right equation." The important thing is *not* getting the same numerical answer as in the back of the book, but understanding the physical concepts and how to apply them! In fact, many times, it is a good idea to try and answer the question *qualitatively* prior to plugging numbers into equations. It is also a good idea, once you think you've solved a particular problem, to ask whether your solution seems reasonable – if you have no idea, it probably means

that you haven't really understood the problem.

You are encouraged to work on homework problems with other students in the class. This can be a very productive way to study, and working with other people to solve problems is a big part of how science and engineering are really done. However, your written work should reflect your own understanding and not be a copy of another person's efforts.

Mid-block Tests and Final Exam**:**

There will be three mid-term exams given during the course: **one on Friday, Sept. 30th, one on Friday, Oct. 28th, and one on Nov. 30th**. These exams are designed give you the opportunity to demonstrate how well you understand the material. Each of them will involve both conceptual questions and problems to solve. In addition, there will also be a final exam at a date and time to be determined by the Registrar.

Laboratory:

You will be performing twelve laboratory experiments over the course of the semester. These labs are an integral part of this course. Physics is an experimental science and did not really get started in its modern form until people began to do careful, quantitative experiments. The physics lab is a place to test and develop your understanding of the physics you learn in the classroom. Not only is it a chance to see if the ideas being presented are actually true, but it also gives a nice glimpse of how scientific information – and confidence in that information – is acquired.

Further information about the laboratory portion of this course can be found in your lab manual, and further information will be provided by your laboratory instructor during your first lab meeting.

Grading

Course Grade:

Your grade in the course will be determined by the following criteria:

Homework	22%
In-Class Activities	5%
Labs	20%
Mid-term Exam 1	11%
Mid-term Exam 2	11%
Mid-term Exam 3	11%
Final Exam	20%

Office Hours:

You are encouraged to stop by my office at any time if you have questions about any aspect of the course. You may not always find me, however, if you drop by unannounced. My official office hours, during which you can count on my being in my office (except under extraordinary circumstances), will be held **Monday, Wednesday, and Friday from 2:00 – 4:00 PM** unless otherwise noted on the course web page. If you are unable to drop by during these official office hours, you may also call or email me to make an appointment for some other time.

Intellectual Honesty:

All exams in this class are closed-book. Calculators are permitted, and you will also be provided with a sheet of useful equations and fundamental constants at the start of each exam. However, the use of any other resources is not permitted. When studying, working in the laboratory, or working on homework problems, I encourage you to work with other students. However, you may not consult a solutions manual or any other source for answers to the problems, and the write-up that you submit to me for each problem should be your own work.

As always, you are expected to abide by the principles of intellectual honesty and academic integrity outlined in the Lafayette Student Handbook, which can be found at

- http://studentlife.lafayette.edu/resources/

Other Useful Information

Supplemental Instruction:

A Supplemental Instruction (SI) leader (Phil Bedoukian) has been appointed for this course. Throughout the course, he will lead formal review review sessions and provide drop-in tutoring support for students in this course. **You are strongly encouraged to take advantage of this free resource**. The tutoring schedule for the SI leader is accessible both on the course web page and on the course Moodle page.

Accessibility Services:

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. If you are requesting accommodations, you must register with the Disability Services Office (administered by ATTIC) for disability verification and for the determination of reasonable academic accommodations. It is **your responsibility** to provide me with an official letter from Disability Services which clearly outlines what those accommodations are. I cannot provide accommodations until you provide me with such a letter. Requests for academic accommodations must be made within the first two weeks of the semester, except in unusual circumstances, so that suitable arrangements can be made in a timely manner.

Informal Surveys:

Over the course of the semester, I want to hear from you how you feel the course is going, what you like, what you don't like, what your concerns are, and how you think the course could be improved. Therefore, at regular intervals throughout the semester, you'll have the opportunity to fill out a short, informal course evaluation so that we can get feedback from you.

Course Communication:

This syllabus, a list of assigned readings and problem sets, and other course materials will be posted on the course web page, which can be found at

- http://workbench.lafayette.edu/~thomasbd/Phys133-IntroPhysicsEM-Fall-2016/Phys133-IntroPhysicsEM-Fall-2016.html

In addition to the course web page, there is also a Moodle page for this course which I will frequently use in distributing course materials, communicating with the class, etc. The Moodle page can be found at

- https://moodle.lafayette.edu/course/view.php?id=9249/

Occasionally, it may be necessary for me to communicate additional information (scheduling changes, clarifications about homework problems, etc.) to the class as a whole. When I do so, I will use your official Lafayette email addresses for all course-related correspondence, so make sure to check your Lafayette email regularly.

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.

Mandatory Credit-Hour Statement:

The student work in this course is in full compliance with the federal definition of a four-credit-hour course. The full policy and practice statement can be found on the Registrar's Office website at

- http://registrar.lafayette.edu/additional-resources/cep-course-proposal/

In Closing

If you have any questions about this syllabus, or about any aspect of the course, please don't hesitate to contact me. The physics of electricity and magnetism is both theoretically fascinating and eminently practical, and over the course of the semester, you'll gain a wealth of new insight into the best understood of the four fundamental forces of nature.