Physics 112—General Physics II: Electricity and Magnetism
Section 1, MWF 11:00 a.m.
Course Description, Spring 2014

Instructor:	Andrew Dougherty
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Web Page:	http://workbench.lafayette.edu/∼doughera/courses/phys112/

Office Hours: Beyond my posted office hours, I will usually be either in my office or lab during the free times indicated on my schedule. Please feel free to call, e-mail, or stop by at any time and ask a question or set up an appointment.

Classes on Snow Days and Other Emergencies: If I am unable to make it to class, I will leave a message on my voice mail (610-330-5212).

Description:

This course is an introduction to the foundations of electricity and magnetism, waves, geometrical and physical optics, and quantum and nuclear physics. The course is designed primarily for students in science who do not require a calculus-based physics course. Recognizing and applying physical ideas is stressed; there will also be an emphasis on problem solving. We will study electric fields and potentials, basic circuits, magnetic fields, electromagnetic waves, and the basic particle/wave duality of quantum physics.

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

Student Learning Outcomes: After completing this course, a student should be able to

- understand, identify, and apply the fundamental principles of physics in a variety of physical situations.
- use both qualitative reasoning and quantitative problem-solving skills in applying those principles.
- Calculate the electric potential and field due to a variety of charge configurations,
- Predict the motion of charges in an electric field,
- Calculate the magnetic field due to current-carrying wires,
- Predict the motion of charges in a magnetic field,
- Find the images produced by simple lens combinations,
- Analyze interference and diffraction patterns, and
- Interpret atomic spectra in terms of quantum energy levels.

Students *also* should be able to engage in the *process* of doing physics, including such tasks as

- developing and testing models,
- generating and interpreting experimental data,
- understanding the role of uncertainty,
- solving problems, and
- communicating results.

Prerequisites: Physics 111, or equivalent.

Texts: *College Physics: A Strategic Approach Technology Update*, second edition, by Randall D. Knight, Brian Jones, and Stuart Field, ISBN-13: 9780321815118, along with along with an online homework component *Mastering Physics*. You can purchase this as a single package at the bookstore. If you did not get *MasteringPhysics* with your text, then you may purchase it online at `http://www.masteringphysics.com/`. Our course ID is `LafayettePhys112Spring2014`. You will also need the *Physics 112 Laboratory Manual*, available in the bookstore.

Your Responsibilities:

Read the text. Your text is a critical resource for this class—it is a source of definitions, facts, ideas, explanations, derivations, and worked examples. I do not intend to spend class time simply repeating the text. Instead, class time will be used to *discuss* those ideas, answer your questions, observe demonstrations, do examples, and practice applying those ideas to various physical situations.

Accordingly, you should read the text ahead of time. I have included a detailed daily syllabus so you know what the assigned readings for each day will be. Occasionally, we may have unannounced quizzes on the assigned reading material.

Ask questions. If you are confused, it is important that you stop me and try to sort it out rather than falling behind. *Please* interrupt and stop the class whenever anything isn't clear. Remember that if you are confused, there are almost certainly many others who are confused as well, and they would welcome your question.

Do all assigned work. A good rule of thumb is that you should anticipate spending approximately two hours outside of class for each hour in class for a college course. This means you should anticipate spending an average of six hours per week outside of class for physics (not including the lab). Plan ahead. I am here to help. If you start on your homework ahead of time, I will be available to help you if you get stuck. Don't wait until the night before an assignment is due before starting it.

Participate in class. Class time will be used to go beyond merely reading the text. Your active engagement during class can play an important part in helping you to master the material. Class time will also be used to announce changes to the syllabus. It is *your* responsibility to keep up.

Tests: There will be three hour-long in-class tests on the dates indicated on the syllabus. There may also be additional quizzes, either announced or unannounced.

Equation Sheet: You will receive an equation sheet with each test. I have included a copy with the course description so that you may use it as you study and do homework problems. The idea is that you will use your study time to focus on the fundamental ideas and practice doing physics rather than to memorize formulae.

Homework Problems: Homework assignments will be due at the beginning of class on the dates indicated on the syllabus. Some assignments will be given and graded on the Web using *MasteringPhysics*, an on-line system with quick feedback, hints, and guided tutorials. Other assignments will be pencil-and-paper problems; these problems will typically focus

as much on the *methods* of solving problems as on getting the right numerical answer. Some of these problems may be graded by student graders; others will be graded by me.

- Problems will be due at the *beginning* of class. **Late homework will normally not be accepted**, since I will hand out solutions in class.
- For written homework, please staple your pages together. This ensures your pages don't get lost.
- **Illegible papers will not be accepted**. If I have difficulty reading or understanding your work, I may return it to you ungraded for re-submission. You may resubmit a legible version (along with the original) by the next class meeting, but that version must not have any new content—it must simply be a legible version of the original.
- Please look at the homework problems ahead of time and ask questions about them either in or out of class. I am happy to give whatever help you need, but it is important that you eventually learn to do these problems on your own—after all, that's what you will have to do on the tests.

Supplemental Instruction: Phys 112 participates in the Supplemental Instruction program (SI) run through Lafayette's Academic Tutoring and Training Information Center (ATTIC). More information will be available on the first day of class.

Academic Honesty: The fabric of science, and indeed any intellectual endeavor, is built on the integrity of all involved. Accordingly, I take academic honesty very seriously. I expect that you will abide by the "Principles of Intellectual Honesty" appearing in the Lafayette College Student Handbook.

Working with others is often a helpful way to learn physics. I encourage you to collaborate with each other on homework, but unless specifically directed otherwise, all work you turn in as your own should be your own.

Academic dishonesty can hurt you in many different ways. First, of course, it is wrong to turn in someone else's work as your own. If you get caught, the penalties can be severe. Second, it hurts your grade. Learning to do problems by yourself is the best preparation for the tests. Students who take the "easy" way out and get excessive or inappropriate help from others tend to get significantly lower grades on the tests.

There are a variety of resources available to help you in your study of physics. These include my office hours, SI, tutoring through ATTIC, and working with classmates. Some students also find it useful to consult other texts, friends, and even a variety of on-line sources. In all cases, though the principles of academic honesty apply: All collaborators must be acknowledged (apart from your instructor), and all work you turn in must be your own.

Please read the department's Academic Honesty policy for the rules regarding collaboration. Feel free to ask if you have any questions about this policy.

Laboratory: The laboratory is an essential part of this class, and successful completion of the laboratory is required in order to pass the course. You are responsible for completing all of the assigned experiments at the scheduled times. If you can not make it to your scheduled lab, please try to come to one of the other sections for this course. You can't count on the equipment being available outside of the scheduled lab times.

Final Exam: There will be a comprehensive final exam at a time to be arranged by the registrar. *Please do not make travel plans that conflict with the scheduled exam time.*

Grades: Your grade will be based on homework (20%), tests and quizzes (40% total), the final exam (20%), and the laboratory (20%). The lowest homework assignment will be dropped. Feel free to ask questions about how your grade is determined.

Andrew Dougherty Spring 2014
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Time	**Mon.**	**Tues.**	**Wed.**	**Thurs.**	**Fri.**
8:00 8:30	*prep*		*prep*		*prep*
9:00 9:30	**Phys 216** HSC 142		**Phys 216** HSC 142		**Phys 216** HSC 142
10:00 10:30	*prep*	**Phys 391**	*prep*	**Phys 391**	*prep*
11:00 11:30	**Phys 112** HSC 100		**Phys 112** HSC 100		**Phys 112** HSC 100
12:00 12:30					*Physics Club*
1:00 1:30					
2:00 2:30	*Office Hours*	*Office Hours*	**Phys 216** LAB	**Phys 216** LAB	
3:00 3:30					
4:00 4:30	Department Meeting	Committee Meeting	*Physics Club*	*Office Hours*	

Syllabus		Physics 112	Spring 2014
Jan.	27	Introduction; Electric Charge	Ch. 20:1–2
	29	Coulomb's Law	Ch. 20:3–4
	31	Electric Field; HW #1	Ch. 20:5–6
Feb.	3	Forces and Torques;	Ch. 20:7
	5	Electric Potential Energy	Ch. 21:1–2
	7	Electrical Potential and Field; HW #2	Ch. 21:3–5
	10	Capacitors and Dielectrics	Ch. 21:6–9
	12	Electric Current; Batteries	Ch. 22:1–3
	14	Resistance; Power ; HW #3	Ch. 22:4–6
	17	Circuits; Series and Parallel	Ch. 23:1–3
	19	DC Circuits	Ch. 23:4–5
	21	Capacitors; RC Circuits; HW #4	Ch. 23:6–8
	24	**Hour Exam I**	
	26	Magnetic Force and Field	Ch. 24:1–3
	28	Sources of Magnetic Field	Ch. 24:4
Mar.	3	Forces on Charged Particles and Currents	Ch. 24:5–6
	5	Torques; Magnetic Materials	Ch. 24:7–8
	7	Magnetic Flux; HW #5	Ch. 25:1–3
	10	Faraday's Law	Ch. 25:4–5
	12	Electromagnetic Waves	Ch. 25:6–8
	14	Traveling Waves; HW #6	Ch. 15:1–3
	17–21	*Spring Break*	
	24	Sound & Light Waves; Energy	Ch. 15:4–5
	26	Loudness; Doppler Effect	Ch. 15:6–7
	28	**Hour Exam II**	
	31	Superposition	Ch. 16:1–2
Apr.	2	Standing Waves	Ch. 16:3–5
	4	Interference; Beats; HW #7	Ch. 16:6–7
	7	Electromagnetic Waves; Interference	Ch. 17:1–2
	9	Thin Films	Ch. 17:4
	11	Diffraction; HW #8	Ch. 17:3,5–6
	14	Reflection and Refraction	Ch. 18:1–4
	16	Lenses	Ch. 18:5,7
	18	Optical Instruments; HW #9	Ch. 19:1–7
	21	Photons; Particles	Ch. 28:1–4
	23	Quantization; Uncertainty	Ch. 28:5–8
	25	The Hydrogen Spectrum; HW #10	Ch. 29:1–3
	28	The Bohr Model; Quantum Mechanics	Ch. 29:4–7
	30	**Hour Exam III**	
May	2	Nuclear Decay	Ch. 30:1–4
	5	Half Life	Ch. 30:5
	7	Nuclear Energy	Ch. 30:6–7
	9	*Final Review*; HW #11	

Final Exam (cumulative)