Physics 202 A **Electricity and Magnetism** **Fall 2016**

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Class Times: MWF 9:40-10:40 (Trexler 273)
Office Hrs: MWF 12-2, Thurs 10-12
and by appointment

Course Description:
Continuation of PHYS 201; electricity and magnetism, circuits, and some applications of classical physics.

Required Materials:
The textbook is Physics for Scientists and Engineers (with Modern Physics), by Serway and Jewett, 8th edition. ISBN-13: 978-1439048443. (Note: you may use the newer 9th or 10th edition if you prefer; I have chosen this edition to keep costs down.)

Why Is This Course Important For You?
You will learn about the nature of electricity and magnetism. These are two of the three fundamental forces through which everything in the universe interacts. (Well, everything bigger than an atomic nucleus, anyway!) These forces act within the framework of Newtonian mechanics, which you studied in PHYS 201. In addition, you will learn how electricity and magnetism concepts manifest themselves in the understanding of the behavior of electric circuits. The analytical and mathematical skills you gain in the process will make you a more effective problem-solver in your chosen field.

Goals for the Course:

1. to understand the principles of electricity, magnetism, and basic DC and AC circuits.

2. to become familiar with several examples of modern technology based on these principles.

3. to further develop analytical skill by solving quantitative problems in a structured way.

You will not need to memorize equations in this course. *In fact, you will be given all the equations you need on the tests*! You will learn to think carefully about the situation described in a problem, applying your knowledge of physics concepts to determine a strategy. The equations to use will follow naturally from a correct conceptual analysis of the problem.

Academic Integrity:
There are no shortcuts to learning physics well. I will follow the college Academic Integrity policy, and you are responsible for knowing and following the college policy. ExpertTA problems may be discussed with others, but you should not take the entire solution process from another person, and you must formulate your solution on your own. If I observe clear evidence of a copied solution on ExpertTA or on a test, I will report a violation to the Academic Integrity committee.

Methods of Instruction:

The concepts of electricity, magnetism, and circuits are interesting, but they can be challenging to absorb. As a result, this course is designed to provide you with multiple passes through the material, with feedback and opportunities to improve your understanding during each pass.

First pass:
You will be expected to do the assigned textbook readings ***before class***. You are not expected to understand everything in the reading, but you should make a real effort to understand it, and try to pinpoint your areas of confusion.

Second pass:
Research has shown that physics students learn better when class time is spent on interactive activities designed to improve conceptual understanding, rather than on direct lecturing on the textbook material. So I generally will not cover the entire reading during lecture. Instead, I will present the main concepts. Then we'll work on several in-class conceptual questions, during which you will both think individually and discuss the questions with your neighbors. Depending on the time available, I may work a demo problem illustrating the day's material and problem-solving techniques.

Third pass:
To really master physics, there's just no substitute for trying to apply physics concepts to a new problem. This is often not easy, but grappling with new problems is where you will make the most actual gains in your understanding. Online Expert TA problems will be due by 9 am on the day of most classes. Access to the Expert TA system costs $27.50 for one semester. Instructions for buying access will be emailed to you, and posted on the course Inquire page. You will be allowed several attempts at solving the Expert TA Problems correctly; since the problems cover recent material, the grading scale is fairly lenient. Solutions will be available shortly after class.

Further resources:
(1) You will ground your understanding in the laboratories; every effort has been made to schedule the laboratory experiments so they coincide with and reinforce the course material. (2) You are encouraged to come to office hours to discuss the material with me, especially if you are having trouble.

Use of Electronic Devices:
In class, you may use personal laptops, but only for the purpose of taking notes. All other electronic devices must be turned off. On tests, you may use a scientific calculator; all other electronic devices must be turned off and out of sight. Violation of this policy on tests will be treated as a violation of the Academic Integrity policy.

Grading and Evaluation:
You should expect to receive a final grade of "A" for 93-100, an "A-" for 90-93, a "B+" for 87-90, a "B" for 83-87, etc. Your final numerical average will calculated as follows:

Tests:	30% (3 @ 10 % each)	Final Exam:	20%
Lab Grade:	25%	MCSP Converation Series:	5%
ExpertTA Homework:	20%		

Tests will be given during class on the dates indicated. *You will be given all needed equations on the test,* though the equations will not be labeled on the test. The final exam has the same format as the tests, and is comprehensive.

Lab grade: Please see the lab class syllabus for information on the lab grade. If any lab is not turned in by the end of the semester, your course grade *will be reduced by one whole letter grade.*

Expert TA Homework assignments are daily assignments, due by 9:00 am the day of class, designed to give you practice on the concepts. You may discuss the general concept(s) involved in a given Expert TA problem with a classmate, but you may not discuss specifics of the solution process.

MSCP Conversation Series reports are completed by attending a talk in the MSCP Conversation Series (see schedule at http://cs.roanoke.edu/MCSPSeries), and submitting a well-written reflection paper. The paper should contain: (i) a brief summary of the key ideas of the talk ; (ii) a description of parts of the talk that were interesting, confusing, or relevant to PHYS 202; (iii) your justified critique, including the level of presentation and the content. **The MCSP paper is due (by upload using Turnitin on our course Inquire site) no later than two weeks after the talk given**. The paper must be word-processed, double-spaced, between 1 and 2 pages in length, and use proper grammar.

Expected Hours of Work

As a one credit course, this course expects you to spend at least 12 hours per week inside and outside of class.

Attendance:

Attendance is very important. Any student who misses a total of five classes unexcused will be dropped from the course with a grade of DF. A warning email (cc'd to your advisor and the registar) will be sent after the fourth unexcused absence occurs. Note that if a student shows up for class 10 minutes late, walks out in the middle of class, or is caught napping/texting/checking emails/browsing the Internet during class, that student will be given an unexcused absence for the class.

Late Work Policy:

The course material is cumulative, so it's important for you to receive rapid feedback on your work. Thus, solutions to Expert TA problems will be available shortly after the class in which they are due. If you have an illness or excused absence which prevents you from doing Expert TA problem or taking a quiz in class, and notify me **beforehand**, I will generally exempt you. If you have a compelling reason to miss a test period, please inform me as soon as possible, so that I can decide if scheduling a make-up test is justified. If your test absence is unexcused, you will receive a zero on the missed test. Please see the laboratory syllabus for the policy on late labs. You must complete all labs by the end of the semester -- if any lab is not turned in by the end of the semester, your course grade will be reduced by one whole letter grade.

Disability Support Services:

If you are on record with the College's Office of Disability Support Services as having academic or physical needs requiring accommodations, please meet with me as soon as possible; we need to discuss your accommodations before they can be implemented. Arrangements for extended time in a semi-private setting must be made at least one week *before every exam*.

To register for Disability Support Services, students must self-identify to the Office of Disability Support Services, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact JoAnn Stephens-Forrest, MSW, Coordinator of Disability Support Services, at 540-375-2247 or e-mail her at: stephens@roanoke.edu to schedule an appointment. If you have registered with DSS in the past, and would like to receive academic accommodations for this semester, please contact Ms. Stephens-Forrest at your earliest convenience, to schedule an appointment.

#	Date	Topic	Chapters	Laboratories
1	Aug. 31	Intro; Simple harmonic motion	15	
2	Sept. 2	Energy of SHO, Pendulum		
3	5	Traveling wave, properties	16 & 17	Simple Harmonic Motion
4	7	Linear wave equation		
5	9	Sound waves, Doppler effect		
6	12	Boundary conditions; interference	18	Resonance
7	14	Superposition principle, standing waves		
8	16	Air columns		
9	19	Electric charge (in motion), Coulomb's Law	23	Electric field
10	21	Continuous charge distribution		
11	23	Electric field and field lines		
12	26	Electric flux	24	Gauss's Law/Exam I Review
13	28	Gauss's Law and Applications		
14	30	**Midterm Exam I**		
15	Oct. 3	Electric potential	25	Electric potential
16	5	Potential due to charge distribution		
17	7	(continued)		
18	10	Capacitors, Capacitance	26	Capacitors
19	12	Capacitor network rules		
20	14	Applications		
		FALL BREAK		
21	24	Electric current and resistance	27	Resistance
22	26	Temperature effects		
23	28	Power and superconductors		
24	31	EMF, Effective resistance	28	Exam II Review
25	Nov. 2	Kirchoffs' Laws, RC Circuits		
26	4	**Midterm Exam II**		
27	7	Magnetic field, force	29	Magnetic Field
28	9	Motion of charged particle in B field, applic's		
29	11	Magnetic force on current-carrying conductor		
30	14	Magnetic torque and applications	30	Magnetism
31	16	Biot-Savart Law, Ampere's Law		
32	18	Gauss's Law of Magnetism		
33	21	Faraday's Law and Lenz's Law	31	
34	28	Generators and Motors		EM Decathlon
35	30	Self-induction and LR circuits	32	
36	Dec. 2	Energy in a magnetic field, LC circuits		
37	5	RLC Circuits		
38	7	AC Circuits	33	Exam III Review
39	9	**Midterm Exam III**		
		FINAL: Wednesday, December 14, 8:30-11:30		

Note: Including physics 202L, you should expect to spend a combined total of 18 hours per week on lecture, homework, and reading for PHYS 202.