

Instructor: Daniel Robb

Office: Massengill 243

Email: robb@roanoke.edu

Phone: 375-5250

Class Times: MWF 9:40-10:40 (Trexler 372)

Office Hrs: T 9-11, W 3-4, via Zoom:

Meeting ID 483 818 7781, Passcode 2583

Course Description:

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

Textbook:

• Physics for Scientists and Engineers, by Serway and Jewett, 8th edition, ISBN-13 978-0495827818 (Note: you may use the newer 9th or 10th edition if you prefer; I have chosen this edition to keep costs down.)

Purpose of the Course:

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.

Specific Goals of 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 your analytical skills 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.

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 an effort to understand, and try to pinpoint 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 no substitute for trying to apply physics concepts to new problems. 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 9:00 am on the day of most classes. Access to the Expert TA system costs \$32.50 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 is being made to schedule the laboratory experiments so they coincide with and reinforce the course material.
- (2) You are encouraged to use office hours to discuss the material, especially if you are having trouble.

Attendance Policy:

If you have a temperature of 100.4 or higher or other coronavirus symptoms, call Health Services IMMEDIATELY if living on campus, or call your family doctor if living at home. Do keep up with all readings, assignments, and deadlines. If Health Services or your doctor informs you that you should isolate for multiple days or weeks, given that the class is online, you may still attend class, or watch cloud recordings of the classes if you prefer. All absences caused by consultation with Health Services or your family doctor about coronavirus symptoms or isolation will be excused.

The following is the course policy for all other absences. You are expected to attend every online class. Attendance is checked after each class meeting, and you must be in class to participate in the in-class activities which form part of the class participation grade. If you are going to be absent from class for a valid (excused) reason, I must be notified in advance. Your fourth and each additional unexcused absence will result in a 2point deduction in your final course grade. Furthermore, you are accountable for all work missed because of any absence. I will provide class materials for a missed class, but will not re-teach a missed class during office hours.

Face Covering Policy:

Face coverings/masks must be worn over the mouth and nose by all students and instructors in classrooms and hallways of academic buildings. By wearing face coverings, we protect our college community and its most vulnerable members.

Feedback 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. I will assign +/- to your final grades by examining the distribution of grades and taking into account my perception of your effort in the course. These are the categories and percentages that will be used:

<u>Tests:</u>	30% (3 @ 10 % each)	<u>Final Exam:</u>	20%
<u>Lab Grade:</u>	25%	<u>MCSP Conversation Series:</u>	5%
<u>ExpertTA Homework:</u>	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.

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 virtual talk in the MSCP Conversation Series (see below; the schedule is 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 one week after the virtual talk is presented. The paper must be word-processed, single-spaced, approximately one page in length, and use proper grammar.

MCSP Colloquium Series:

This semester a series of virtual talks will be offered which are related to math, computer science and physics. Participation in at least two of these sessions is mandatory. Within one week of attending a virtual talk you must submit (via Inquire) a one-page single-spaced paper. Please see the guidelines for expected content.

Policy on Late Work:

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 an Expert TA problem, and notify me beforehand, I will generally exempt you. Please see the laboratory syllabus for the policy on late labs.

Make-up Tests:

Make-up tests will not be given. If you miss a test, and have an official college excuse for that absence, then your final exam grade will count for the missed test. If your test absence is unexcused, you will receive a zero on the missed test.

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. Be aware that I am contractually obligated to report students if I suspect that they have engaged in academic dishonesty. Lastly, unless otherwise directed, cell phones should be silenced and out of sight during all class periods.

Use of Electronic Devices:

On tests, you may use a scientific calculator; all other electronic devices must be turned off. Violation of this policy on tests will be treated as a violation of the Academic Integrity policy.

Technology challenges:

You will need internet connectivity. If you have technology challenges, I need you to email me so that we can discuss how you can keep up.

Accessible Education Services (AES):

(AES) is located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Laura Leonard, Assistant Director of Academic Services for Accessible Education, at 540-375-2247 or by e-mail at aes@roanoke.edu to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Laura Leonard at your earliest convenience to schedule an appointment. If you are on record with AES as having academic or physical needs requiring accommodations, please contact me as soon as possible. We need to discuss your accommodations before they can be implemented. Also, please note that arrangements for extended time on exams must be made at least one week before every exam.

#	Date	Topic	Chapter(s)	Laboratories
1	Aug. 19	Intro; Simple harmonic motion	15	No lab
2	21	Energy of SHO, Pendulum		
3	24	Traveling wave, properties	16 & 17	
4	26	Linear wave equation		Lab 1: Oscillatory Motion (Pendula)
5	28	Sound waves, Doppler effect		
6	31	Interference, standing waves, and harmonics	18	
7	Sep. 2	Resonance and air columns		Lab 2: Wave Motion and Interference
8	4	Beat patterns and non-sinusoidal waves		
9	7	Electric charge (in motion), Coulomb's Law	23	
10	9	Continuous charge distribution		Lab 3: Standing Waves & Quantum #'s
11	11	Electric field and electric field lines		Arduino Project 01
12	14	Electric flux	24	
13	16	Gauss's Law and Applications		Test review
14	18	TEST 1		
15	21	Electric potential	25	
16	23	Potential due to charge distribution		Lab 4: Electric Charge, Field, Distributions
17	25	(continued)		Arduino Projects 02 and 03
18	28	Capacitors, Capacitance	26	
19	30	Capacitor network rules		Lab 5: Arduino Projects 04, 05 or 06
20	Oct. 2	Capacitor applications		
21	5	Electric current and resistance	27	
22	7	Temperature effects		Lab 6: Measuring Resistance, Temp, Current
23	9	EMF, Effective resistance	28	Arduino Projects 07
24	12	Kirchoff's Laws, RC Circuits		
25	14	Magnetic field, force	29	Test Review
26	16	TEST 2		
27	19	Motion of charged particle in B field, applications		
28	21	Magnetic force on current-carrying conductor		Lab 7: Magnetic Forces and Electromagnetism
29	23	Magnetic torque and applications	30	Arduino Project 10
30	26	Biot-Savart Law, Ampere's Law		
31	28	Gauss's Law of Magnetism		Lab 8: Biot-Savart and Field Measurements

32	30	Faraday's Law	31	
33	Nov. 2	Lenz's Law		
34	4	Generators and Motors		Lab 9: Arduino Motors and Generators
35	6	Self-induction and LR circuits	32	
36	9	Energy in a magnetic field, LC circuits		
37	11	RLC Circuits		Test Review
38	13	TEST 3		
39	16	Review and Catchup		
		FINAL: Saturday, November 21, 8am – 12pm		

Note: Including the lab, you should expect to spend a combined total of about 18 hrs/week on this course.