Spring 2019 Physics 142 Syllabus

Lecture: Mon Wed Fri 9:00am-9:50am, Oxford Science Building 223
Lab: Wed 2:00pm-5:00pm, Oxford Science Building 217
Instructor: Thomas Osburn (tosburn@emory.edu)
Office: Oxford Science Building 202
Office Hours: TBD (please fill out online poll: https://www.surveymonkey.com/r/THC3FV6)
Student tutor location and times: OSB Nucleus (second floor lobby) 7:00pm-9:00pm
Student tutor days: Mon Tue Thur – *Louie*; Wed – *Grace*; Sunday – *Erin*
Online Textbook with WebAssign: "College Physics" by Serway and Vuille

The purpose of this course is to study electromagnetic interactions between matter and to quantify the influence those interactions have on how things move. Understanding these interactions will empower you to make accurate predictions about the world around you. Accurate scientific predictions are the driving force behind technological developments that shape modern society. In particular, physics breakthroughs have been responsible for the industrial revolution, the age of electricity, computers, and more! This course will also help you appreciate how physics concepts are constantly being used in other sciences (i.e., chemistry, biology, geology, etc.). Finally, mastery of introductory physics will amplify your critical thinking and problem solving skills.

Goals of the Course

At the end of this course, we will be able to:

1. Explain the basic concepts, theorems, and principles of physics (and when they apply)
2. Recognize the limitations of these physical models (where the assumptions break down)
3. Apply these models to solve both simple and advanced (i.e., multiple-step or multiple-concept) physics problems by learning how to
    a. Deconstruct (i.e., break down) a big problem to its component "mini" problems
    b. Identify and analyze which scientific models apply to each "mini" problem
    c. Reconstruct the overall solution by combining results from the "mini" problems
    d. Think critically about whether your final answer is reasonable relative to the concepts you have learned
4. Develop an organized and systematic solution to a problem
5. Integrate multiple concepts/principles when analyzing a complex phenomenon
6. Recognize how physical models apply to our day-to-day experiences
7. Begin to develop the quantitative and modeling skills used by scientists and engineers
8. Understand the questions physicists ask and the tools they use in order to discover knowledge in this field.

To achieve these goals, we will solve many problems, use laboratory exercises, and discuss real-world applications while employing the mathematical tools of algebra (and some calculus) in the process. We will be covering a lot of important concepts/principles/theorems during this semester. For this reason, you will have daily assignments and frequent quizzes.

Homework: All homework assignments and other announcements and handouts will be posted on Canvas or WebAssign. Therefore, **you are expected to check Canvas and WebAssign at least once a day**.

Omission on your part to do so will not be regarded as a valid excuse for not completing an assignment. Homework assignments will be of two different kinds:

a) **Daily reading:** After each class, I will assign the reading that you are REQUIRED to do BEFORE coming to class the next time. These reading assignments will appear on Canvas. **I will ask for oral responses during class.** By doing the reading before coming to class, you will be better prepared to follow the discussion that will take place in class.
b) **Daily WebAssign homework:** This semester you will have online homework assignments due at 12:30am the night (early morning) before most lectures through an online program called WebAssign. It is your responsibility to check WebAssign frequently to stay on top of the assignments. WebAssign also has study tools built in that can be used in concert with your online textbook. Enroll at webassign.net. **Class key: emory 9172 8784**

Notice that there are *daily* assignments. **The goal is to review the material often for maximum retention.**

Quizzes: There will be frequent quizzes at the beginning of lab on the material that was discussed in the lectures and homework assignments. Quizzes cannot be made up: If you miss lab the day when a quiz is taken, then you will receive a grade of zero for that quiz (contact me as soon as possible if you must miss lab in an extreme emergency). Just as with the homework assignments, the goal is to ensure that you review the material frequently.

Tests and Exams: There will be three tests (for dates, see below). The tests will be on the material discussed up until that point (the second test will cover the material before and after the first test) but recent material will be emphasized.

Re-grading Assignments: I am very careful when I grade assignments. However, I might make mistakes when I grade. If you would like me to re-grade a test/quiz/assignment, your request should be submitted to me **in writing within 24 hours** from the time I give back the graded assignment. Note that such a request will result in me re-grading the whole assignment/test/quiz (not just the specific problem you requested).

Attendance: Absences will only be excused in cases of medical or family emergency. Attendance will be recorded at the beginning of each class through a sign-in sheet, and your attendance percentage will be incorporated into your final grade (see percentages below). Students who are 1-5 minutes late will accumulate a "half-absence" (they receive half credit for that day's attendance), students who are more than 5 minutes late will be considered absent for grading purposes (although you are welcome to come anyway for the sake of learning the course material).

Grading: Grades are assigned on the plus-minus scale. The final grade will be determined based on the following weighting:

Attendance: 5%
WebAssign Homework: 15%
Quizzes: 15%
Test 1: 15% (test 1 will occur during lab)
Test 2: 15% (test 2 will occur during lab)
Test 3: 15% (test 3 will occur during the final exam period)

Labs (lab questions, full lab report): 20%

Course Content: Electricity, Magnetism, Optics

Important dates: Make sure you include these important dates in your planner/calendar. An entire lab period will be devoted to the first two tests

Date	Description
February 20, 2019 (during lab)	Test 1
March 6, 2019 (beginning of lab)	Full lab report due
April 3, 2019 (during lab)	Test 2
May 8, 2019, 9-12 (during final exam)	Test 3

Working with the Honor Code: The Oxford College Honor Code applies to this course as follows:

Quizzes, tests: The work presented in these assignments should be your own. No collaboration permitted. You are expected to follow the instructions given by me and abide by the Honor Code. Sharing calculators, pencils, etc., is not allowed.

Lab report: On these assignments you can only collaborate with your lab partners.

WebAssign Homework: You are strongly encouraged to work on the homework assignments **by yourselves first, before consulting others (classmates, tutor, me, etc.) for help.**

Study groups: Even though you cannot work together on quizzes, tests, and exams, you are definitely encouraged to form study groups and study concepts together and explain to each other things about which you were not clear from class or from your reading assignments. However, as mentioned above, you are strongly encouraged to work on the homework assignments by yourself first, before consulting your classmates for help.

Religious Holidays: Please make every effort to negotiate your religious holiday needs within the first two weeks of the semester; waiting longer may compromise your instructor's ability to extend satisfactory arrangements. Emory's official list of religious holidays may be found at http://www.religiouslife.emory.edu/faith_traditions/holidays.html.

Strategies for solving physics problems

Physics problems often involve numerous interconnected mathematical steps where each equation represents a certain physics principle that has been carefully selected based on a specific property of the system. When approaching these problems, it is important that you adopt a strategy to organize and process not only the provided information, but also to account for additional elements that you must introduce independently to relate the final answer to the given quantities. An effective and detailed problem solving strategy will first guide you to the correct answer, but it will also then facilitate clear communication of your solution during assessment. **Therefore, you are required to carefully show every step and how those steps are motivated by applicable physics principles.** As a part of that process **you are required to draw a diagram depicting the scenario with labels** for all relevant known and unknown quantities. Here is a suggested list of steps to follow in your solution:

1. **Read the problem** carefully and identify relevant given info and unknown quantities.

2. **Draw a picture** depicting the scenario. You may also need other diagrams such as a force diagram.
3. **Label all the quantities** in the diagram, those that are given and those that you need to find. Also, **show your coordinate system!**
4. **State the Physics Laws/Principles/Theorems** that apply to that problem and explain why. Here you don't need an essay, a sentence is enough. For example: ``No external forces act on the system ➔ Conservation of Momentum applies."
5. **Write the law in equation(s) form**. To continue the example, at this point you might say: $\overrightarrow{P_{final}} = \overrightarrow{P_{initial}}$
6. When you accumulate as many valid equations as unknowns, **solve the system** of equations in terms of symbols (variables) representing the known quantities. Then plug values into your final expression. Also, **show your work**! By including intermediate steps I can help you understand ways to avoid possible mistakes in the future.
7. **Check your answer**. Do the units match? Does the sign in front of your result make sense? Is the answer too big or too small compared to what you expected?

Requirements for the Lab portion of this course

As noted above, the lab portion of the course constitutes 20% of your grade. Your student account will be automatically charged (less than $10) for the lab manual. For the lab portion of the course the requirements are as follows:

1. Bring your lab manual: You will be given the lab manual at the beginning of the semester. You are expected to have read the lab handout for each week's lab BEFORE coming to the lab.
2. Answer all the questions in the lab handout: Some of these questions will require that you spend time at home analyzing the data and making plots with Excel. ALWAYS bring the answers to those questions and the plots to the next lab. This will count towards your lab grade.
3. Understand the lab: Experiments require repetition in order to ensure that your data is reproducible. Sometimes students regard this repetition as "busy work". However, remember that at all times you need to be thinking about what your data means, if this is what you expected and why (or why not) and, also, what the reproducibility (or lack of) means. Essentially you are expected to be thinking about what conclusions you can draw from your data.
4. A full lab report. For one lab experiment (see lab schedule) you will write a full lab report. I will give more detailed handouts on what a proper scientific lab report should look like when the time comes.

Lab Schedule

These dates may be adjusted to reflect the pace of the course:

1/16: No lab meeting

1/23: Quiz 1, lecture during lab

1/30: Quiz 2, Experiment 1: Equipotential lines and the electric field

2/6: Quiz 3, Experiment 2: Measurement of capacitance (**full lab report**)

2/13: Quiz 4, Experiment 3: Basic electricity

2/20: Test 1

2/27: Quiz 5, Experiment 4: The oscilloscope – RC circuits

3/6: Quiz 6, lecture during lab, **full lab report due**

3/13: No lab meeting (Spring Break)

3/20: Quiz 7, Experiment 5: The Earth's magnetic field

3/27: Quiz 8, Experiment 6: Faraday's law

4/3: Test 2

4/10: Quiz 9, lecture during lab

4/17: Quiz 10, Experiment 7: Optics

4/24: Quiz 11, lecture during lab

Acceptable and unacceptable class/lab behavior

For our class and lab you are expected to

a) have done the reading and homework problems (i.e., you are expected to come prepared)
b) have all the things you will need during class and lab (calculator, lab manual, office supplies, etc.)
c) pay attention and take notes

There are certain things that I have observed students do during class and lab that I find unacceptable. In those cases I ask the students to leave the classroom or laboratory and I count them as absent.

You cannot:

a) eat during class/lab
b) drink during class and lab (except for water)
c) not pay attention by sleeping or being distracted
d) distract other students
e) text during class/lab
f) be disrespectful

If you need to leave the classroom or laboratory for any reason, you should avoid being disruptive and distracting. Try to leave the class/lab quickly and with as little noise as possible. You should not have to leave the class/lab more than once.

This syllabus is subject to change at the discretion of the instructor.