

# Physics 122: Session I, Summer 2012

**Course title:** Introductory Physics with Calculus

**Instructor:** Catherine Asaro

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**Office:** Room 313 in the Physics building

**Office hours:** Tuesday and Wednesday, 12:00-1:50 pm

**Discussion Section Leader:** Lufti Nimer

**Dates of course:** 07/10/2012 - 08/16/2012

## Suggested Texts

Recommended text: *University Physics with Modern Physics*, by Hugh D. Young and Roger A. Freedman

You don't need the Mastering Physics portion. If you already have a different text for calculus-based university physics, you may use that as long as it covers thermodynamics, electromagnetism, and DC and AC circuits.

## Class times

Lecture: Tuesday and Wednesday, 2:00-5:15 pm, with a break about halfway through

Discussion sessions: Thursday, 2:00-5:15 pm, with break

## OBJECTIVES

This class is an introductory course in thermodynamics, electricity, and magnetism. The objectives are twofold:

- 1) To understand the concepts for thermodynamic, electric, and magnetic phenomena. Your knowledge of the material will be tested in written homework, online assignments, and exams. On tests, problems dealing with this conceptual nature of the physics will be qualitative, either brief written answers or multiple-choice.
- 2) To solve rigorous problems using the physical concepts and their associated equations. Your ability to solve such problems will be tested in homework and exam questions that require you show your work. Partial credit may be awarded depending on how much your solution shows mastery of the concepts and/or the ability to apply the appropriate equations in a physical reasonable manner.

## COURSE STRUCTURE

Grades will be assigned according to the following.

- |              |                 |                   |
|--------------|-----------------|-------------------|
| • Quizzes    | weekly          | 15% of your grade |
| • Homework   | weekly          | 20% of your grade |
| • Midterm I  | Tuesday week 3  | 20% of your grade |
| • Midterm II | Tuesday week 5  | 20% of your grade |
| • Final Exam | Thursday week 6 | 25% of your grade |

The scores for all your work will be added up, and your percentage of the total possible points for the course computed. Based on that percentage, grades will be assigned as follows:

- |           |     |
|-----------|-----|
| • 87-100% | = A |
| • 72-86%  | = B |
| • 60-71%  | = C |
| • 50-59%  | = D |
| • 0-49%   | = F |

## COURSE OVERVIEW

**Physics 122 is a tough course!** To learn the material well, you must understand both the physical concepts and how to apply those concepts and the associated equations to solving problems. It is not enough to read the text; you must also practice by doing many problems.

Problem solving at this level involves a great deal of math. You need fluency in algebra, geometry, trigonometry, and the graphing and interpretation of equations. In addition, some problems will require calculus. Math 152, Calculus and Analytic Geometry II, is a corequisite for this course; you should know and be able to apply the techniques of integration and differentiation.

To do well in this class requires **a lot** of time. In only six weeks, we cover a full semester's worth of material for a four credit class. The guideline that a course needs "three hours outside of class for every hour in class" applies here. For class + homework + study time, you should expect to spend roughly 35 hours per week. So taking this class is almost the same as having a full time job. If you want to do well, you need to plan your summer so you will have sufficient time for the work.

## HOMEWORK AND QUIZZES

Homework assignments will be given in lecture on Tuesday and will be due the following Tuesday at the start of class. You will also have five quizzes, for a total of ten assignments you will be responsible for during the semester, in addition to the two midterms and the final. You must show your work for credit. **Giving a solution without showing how you obtained that answer will get zero points even if it is the correct answer.**

Each homework set will have ten problems, each worth ten points. Quizzes will have 3-5 problems.

Homework will be collected in class on Tuesday. You have until 2:15 pm on the day assignments are due to turn them in. **No exceptions to this due date will be made.** If you haven't handed in your homework by 2:15 pm, you will receive a zero for that assignment.

You may drop the lowest grade of the ten assignments. Also, on the last Wednesday of class, you will be given one hour to redo any written homework or quiz for a higher grade. These are two built-in excused absences that give everyone in class the same treatment and provide you a chance to review whatever material you may have missed. **Please do not ask for other excused absences.**

## DISCUSSION SECTION

Your discussion leader, Lufti Nimer, will work with you on Thursdays. From 2:00-4:15, he will go over the material we are covering in class, the homework problems, and any other questions you have pertaining to the course. From 4:15-5:15, he will give you the quiz for that week, which I will write base on the in-class and homework problems. In the sixth week, you won't have the quiz, since that is the week of the final. You will have three hours for the final exam on the last Thursday of class.

Attendance in section is important; taken together, the homework and quizzes make up 35% of your grade.

## EXAMINATIONS

Midterms will be closed book, but you may bring one sheet of paper with anything you would like written on either or both sides. I will also include a list of potentially useful constants on the tests. On the day of the exam, after you hand in your homework, I will spend 50 minutes on a review of the homework and the material on the test. You may ask whatever questions you have on the material during the review. The rest of the lecture time you may spend on the exam.

**FINAL EXAM:** The Final will be cumulative, with an emphasis on material covered after Midterm II. It will be open book.

You may use a calculator for exams, but it may not have programming capability, a QWERTY (keyboard-like) keypad, use an electrical outlet, or make weird noises. You may not use any of the following on exams: laptops or portable or handheld computers; an electronic writing pad or pen-input-driven device; pocket organizer; or cell phone. Your phone must be turned off. If it rings, your irate professor (that's me) will confiscate it.

## AUDITS AND INCOMPLETES

To receive credit for auditing the course, you must take the final exam and pass it with a score of at least 70%.

If you need to request an incomplete, please read the catalogue statement on acceptable grounds for an I grade. You must be doing "qualitatively satisfactory" work to qualify for an incomplete, which in this class means earning a C grade or better at the time you request the incomplete.

## COURSE SCHEDULE

### Week I

- Ideal gas law,  $pV$  work, first law of thermodynamics, thermal physics, specific heat
- Adiabatic and isothermal processes, heat engines
- Second law of thermodynamics, entropy

### Week II

- Electric forces, electric fields, Coulomb's Law
- Electric fields, electric potential and energy, flux, dipoles, torque
- Gauss's Law, extended charge distributions, capacitance

### Week III

- Capacitor circuits, series and parallel, dielectrics
- Current, resistance, DC circuits, RC time constants
- Magnetic forces and torques, magnetic fields, magnetic dipole moment

### Week IV

- Current and magnetic fields, Biot-Savart Law, Ampere's Law
- Kirchoff's voltage and current laws, circuit diagrams
- Solenoids, induction, Lenz's Law, Faraday's Law

### Week V

- Coils, self inductors, mutual inductors, transformers, generators
- Magnetic materials and types of magnetism, inductors and time constants

### Week VI

- AC circuits, AC resonance, RCL series circuits and damping, course review