Syllabus

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Physics 211--Vibrations, Waves and Optics

Fall 2014

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Letter to Students

This course constitutes the third in the four-course introductory calculus-based sequence in physics. We will focus on harmonic motion, waves, and optics. The course is intended to form a conceptual and mathematical bridge to the topics in modern physics that you will encounter next semester. Recently retired Professor Larry Robinson designed and implemented the experiments that we will undertake this semester. In this sixth year in which I assume responsibility for the course I will make few changes in his successful design. On the other hand, I want you to be aware that we in the Department are continually seeking to improve. If at any time you have suggestions for changes that would assist your understanding, please don't hesitate to tell me.

I do hope you are looking forward to this experience as much as I am.

Sincerely,

Don Salisbury

Course Description

This course will introduce you to the study of mechanical vibrations, waves, and optics. Subjects to be studied include oscillations and resonance, one-dimensional wave motion, partial derivatives, and the one-dimensional wave equation. Additional topics include an introduction to Fourier analysis, and sound waves. After a brief study of Maxwell's equations, an overview of the principles of geometrical optics will presented, and

interference, and diffraction of light waves, including holography, will be the final topics in the course.

Course Goals

The goals of the course include the following:

- Extend the range of physics topics in the required sequence for physics majors. Topics brought together in one course include vibrating systems, resonance, the physics of waves--propagation, interference, and diffraction--as illustrated with sound, light, and other wave forms.
- Raise the mathematical level of students by introducing concepts from ordinary differential equations, partial derivatives, and partial differential equations, especially the wave equation. Also introduce Fourier techniques as applied to physical systems.
- Introduce and apply *Mathematica* to the study of physics. I believe that *Mathematica* can excite, engage, and empower students of physics.
- Begin the formal study of measurement theory, experiment analysis and design. This will be done primarily through carefully selected laboratory exercises that illuminate and extend the ideas discussed in class.

Required Texts

1. The main text for the course is the sixth edition of *Physics for Scientists and Engineers* by Paul Tipler and Gene Mosca (W.H. Freeman and Company, 2008).

2. The text that focuses on measurement theory and experiment design/analysis is *Experimentation* by D.C. Baird published by Prentice-Hall (1995). We will call on this reference many times in our laboratory work this semester.

2. *Schaum's Outline of Mathematica (Second Edition)* by Eugene Don (McGraw-Hill, 2009) will provide a reference for *Mathematica*. *Mathematica* is an incredibly powerful computational tool that you will use in most all of the physics courses at AC. This volume is not required, but strongly suggested--it will serve you well in all succeeding physics courses.

I strongly encourage you to keep these volumes once this course ends. Each in its own way will be a valuable resource in future courses.

Course Requirements

Classroom meetings will include a variety of activities, many of which will require your active engagement. Since you must be present to participate, **class attendance is required and expected**. Excessive absences will result in grade penalties. You must participate in and complete **all** laboratory exercises; copying from a member of the class after an absence will be considered plagiarism. Homework assignments, whether from lab or class, are due at the **beginning** of class on the due date. Homework problems assigned from the text are due at the next class meeting unless explicitly noted otherwise. Each of you will make presentations in class during the term, giving the experimental results and conclusions obtained by your group on the previous experiment. Each of these presentations will count as a homework assignment. You need a three-ring binder in which you will keep your lab work, all forms of homework (lab, class, *Mathematica*), etc. I will collect and evaluate this notebook over the semester.

Grades

There will be three in-class tests and a final, comprehensive exam; each will count 15% of the final grade. The final exam grade will be substituted for the lowest test grade if that benefits you. **The tests are scheduled on the following dates: 10/1, 10/27, and 11/21.** Homework and other in-class assignments will count 15% as well. The laboratory grade will make up the final 25%. The lab grade will consist of two parts; one part (65% of the lab grade) will be earned by successfully performing the required activities specified in the experiment instructions, and the remainder (35% of the lab grade) will come from lab homework.

Grades Summary

Tests and Exam (15% each)	60%
In-Class Assignments (HW and other)	15%

Laboratory (Performance and HW)	25%
Total	100%

ELR 8/07, Revised DCS 8/14

Academic Integrity

You are expected to abide by the college academic integrity policy, which is outlined in the *Environment*, the student handbook. These general policies apply unless the instructor distributes explicit, written instructions to the contrary. According to a recent survey on campus, there appear to be some differences between faculty and student understanding of specific instances of unpermitted behavior. One hundred percent of faculty responding to the survey view all items on the following list as unpermitted behaviors.

1. Turning in work done by someone else.
2. Working on an assignment with others when the instructor asked for individual work.
3. Receiving unpermitted help on an assignment.
4. Writing or providing a paper for another student.
5. Getting Q/A from someone who has taken test.
6. In a course requiring computer work, copying a friend's program rather than doing your own.
7. Helping someone else cheat on a test.
8. Falsifying lab or research data.
9. Fabricating or falsifying a bibliography.
10. Copying from another student during a test or examination **without** his or her knowing it.
11. Copying from another student during a test **with** his or her knowledge.
12. Copying a few sentences of material from a written source without footnoting them in a paper.
13. Turning in a paper either purchased or plagiarized, in large part, from a term paper "mill" or website.
14. Copying a few sentences of material from an Internet source without footnoting them in a paper.
15. Using unpermitted crib notes (cheat sheets) during a test.
16. Copying material almost word for word from any written source and turning it in as your own work.
17. Altering graded test and submitting it for additional credit.
18. Turning in a paper copied from another student.
19. Using a false excuse to obtain extension on due date.
20. Hiding or damaging library/course material.
21. Cheating on a test in any other way

22. Cheating on a written assignment in any other way.

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