PHYS 205 Modern Physics:
MWF 11-11:50 AM (Lab: T 1-3:50 PM)
The College of Wooster
Fall 2011

Instructor: Cody Leary
Office Hours: Mon 3-4 PM, Tues 9-10 AM, Tues 3-4 PM, and by appointment
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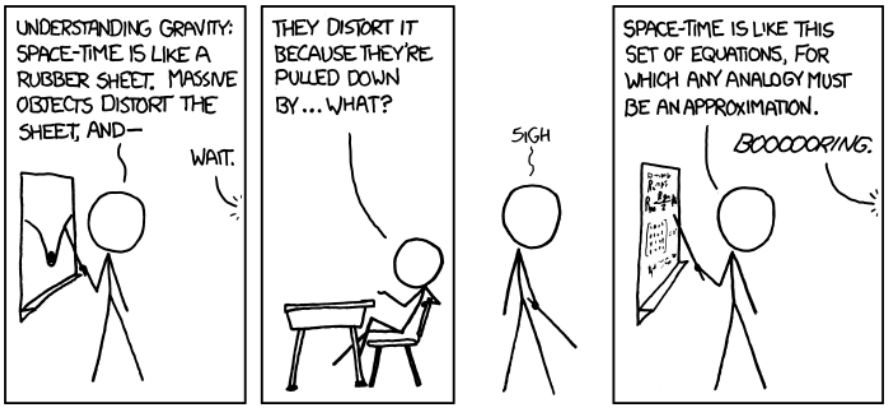
Text: Modern Physics by Taylor, Zafiratos, & Dubson, 2nd edition

Course Website: `http://woodle.wooster.edu`



http://xkcd.com/123/

About This Course

Physics 205 is the final course of our three-semester introduction to physics. In Physics 203 and 204 we learned classical physics, from the development of mechanics in the 1600s by Isaac Newton to the understanding of electric and magnetic fields developed in the late 1800s by Michael Faraday, James Clerk Maxwell and others. In Physics 205, we move from classical physics into modern physics and begin to explore special relativity, the quantum nature of light, the wave properties of matter, and quantum mechanics. The major goals for the course are for students to:

- Develop an understanding of relativity, photons, matter waves and quantum mechanics
- Connect these concepts to the models and equations we use to describe nature
- Understand the historical experiments showing that classical physics is not sufficient to describe very small or very fast objects
- Continue developing the capacity to break down a problem into solvable pieces
- Learn to explain scientific results effectively and concisely in writing.

This course is a W, or writing-intensive, class. Most of the writing for this class is in the form of scientific reports on the experiments you will do in lab. You are required to revise each report. We may also have some short writing assignments as part of the homework.

Quantum mechanics is the greatest intellectual accomplishment of the human race.

Before quantum mechanics, humans understood motion, gravity, gases, and a little bit about electricity and magnetism. With quantum, we understand the underlying behavior of everything you are likely to experience in your lifetime! The properties of all basic materials (why are metals shiny and usually silver? why is glass clear? why is rubber stretchy?), properties of light and other electromagnetic waves, how light interacts with matter, Quantum mechanics is the basis for all modern technology.

Guiding Principles of the Course

- People understand concepts better by seeing them in action and **thinking** about them than by hearing them explained.
- We learn physics by working problems, not by reading about working problems. Understanding physics is a learned skill, like cooking or playing basketball. It takes time, effort, and practice.
- People tend to learn best by thinking about topics and discussing them with others.
- Students learn most when they take the responsibility for what is learned.

In this course, many topics are counter-intuitive and contradict our existing ideas about how the Universe works. To overcome our misconceptions, we must confront them, figure out why our initial idea is wrong, and build a new understanding of the situation. This takes a lot of practice. Research has shown that students learn and retain the most when they make a sustained consistent effort each week, rather than cramming before exams.

Homework

I will post homework assignments, along with their associated due dates and solutions, on the Woodle course website at `http://woodle.wooster.edu`. You should be automatically enrolled in this Woodle course within 24 hours of the time when Wooster's Registrar officially adds you to this course, as this synching occurs around midnight each day. Once enrolled in the Woodle course, your login username and password for Woodle should match that of your Wooster email account.

About Homework

The goal of the homework is for you to practice. In some ways, physics is like a sport or like playing a musical instrument. It is not enough to know intellectually how to throw a football pass or how to play arpeggios on the piano. To actually hit the receiver or make it to Carnegie Hall, you have to practice. For physics, that practice is homework. Like sports or music, it is more important to try than to worry about getting it right the first time. If you already know the solution, it isn't a problem, but an exercise. To encourage you to work on the challenging homework problems, they are graded partially on effort. The important part of your homework is how you solve the problem, not the number that you get as a result. If the number were really important, it wouldnt already be in the back of the book. Consultation and collaboration with your fellow students is recommended, but the homework solutions you hand in must be your own work. The secret to success in this course is taking the homework seriously! Work the problems and come to class and office hours with any questions that arise.

Individual homework problems will **not** be graded, although I will collect and look over each homework assignment as a whole for completeness, and assign credit accordingly.

Quizzes

There will be regular in-class quizzes in this course, which will consist **completely** of problems from previous homework sets. The course is set up this way to encourage you to understand the homework thoroughly– if you understand each homework problem, you are guaranteed to do well on the quiz.

When writing your problem solutions, being able to explain what you have learned is an essential step in the learning process. Thus, for all homework, quizzes, and exams, your thought process should be clear. Neatness counts. Your steps should be explained using short phrases. Any sketches or graphs should be clearly labeled.

Getting Help

Office Hours

I really enjoy teaching physics and am happy to help you outside of class, with either individual attention or in groups. If you would like help, please feel free to drop by my office during my regular office hours, or any other time you see my door open. If your schedule conflicts with my office hours, you can contact me about making an appointment outside of these times.

Academic Support from the Learning Center

The Learning Center (ext. 2595) offers services designed to help students improve their overall academic performance. Sessions are structured to promote principles of effective learning and academic management. Any student on campus may schedule sessions at the Learning Center. The Learning Center also offers a variety of services and accommodations to students with disabilities based on appropriate documentation, nature of disability, and academic need. Any student with a documented learning disability needing academic accommodations is requested to speak with me and with Pam Rose, Director of the Learning Center (ext. 2595), as early in the semester as possible. All discussions will remain confidential.

Grading

Your grade will be calculated as follows:

Homework Completeness:	5%
In-class quizzes:	20%
Lab Reports:	25%
Exams (combined):	50%

Final Grade:

A 92.5-100%, A- 90.0-92.4%, B+ 87.5-89.9% . . . , C- 70.0-72.4%, D 60.0-69.9%, F 0-59.9%

The above final grade standards may be relaxed, but will not be raised.

How Problems are Graded

Each quiz and exam problem will be graded according to the following scale (patterned off Thomas Moores approach at Pomona):

- 5 pts: good effort with no errors (correct results and reasoning and well-explained)
- 4 pts: good effort but with minor errors OR fair effort (not well-explained) with no errors
- 3 pts: good effort with modest conceptual or math errors OR fair effort with minor errors
- 2 pts: good effort with serious errors OR fair effort with modest conceptual or math errors
- 1 pt: very poor effort
- 0 pts: no effort

The two lowest quiz grades will be dropped.

Campus-Wide Policies

Academic Honesty and the Code of Academic Integrity

The academic program at the College seeks to promote the intellectual development of each student and the realization of that individual's potential for creative thinking, learning, and understanding. In achieving this, each student must learn to use his/her mind rigorously, independently, and imaginatively.

The College's understanding and expectations in regard to issues of academic honesty are fully articulated in the Code of Academic Integrity as published in The Scot's Key and form an essential part of the implicit contract between the student and the College. The Code provides a framework at Wooster to help students develop and exhibit honesty in their academic work. You are expected to know and abide by the rules of the institution as described in The Scot's Key and the Handbook of Selected College Policies at www.wooster.edu.

Dishonesty in any of your academic work is a serious breach of the Code of Academic Integrity and is grounds for an "F" for the entire course. Such violations include turning in another person's work as your own, copying from any source without proper citation, crossing the boundary of what is allowed in a group project, submitting an assignment produced for a course to a second course without the authorization of all the instructors, and lying in connection with your academic work. You will be held responsible for your actions. Particular attention should be directed to the appropriate use of materials available through the Internet. Whether intentional or not, improper use of materials is a violation of academic honesty. If you are unsure as to what is permissible, please contact your course instructor.

Policy Regarding Conflicts with Academic Responsibilities

The College of Wooster is an academic institution and its fundamental purpose is to stimulate its students to reach the highest standard of intellectual achievement. As an academic institution with this purpose, the College expects students to give the highest priority to their academic responsibilities. When conflicts arise between academic commitments and complementary programs (including athletic, cultural, educational, and volunteer activities), students, faculty, staff, and administrators all share the responsibility of minimizing and resolving them.

As a student you have the responsibility to inform the faculty member of potential conflicts as soon as you are aware of them, and to discuss and work with the faculty member to identify alternative ways to fulfill your academic commitments without sacrificing the academic integrity and rigor of the course.

Policy Regarding Final Examinations

The College sets the final exam date, and professors are not authorized to grant exceptions. Students who wish to reschedule a final exam must petition the Dean for Curriculum and Academic Engagement in writing in advance of the examination. The student must confer with the instructor before submitting a petition, and the instructor should indicate to the Dean if he or she supports the petition. Normally, such petitions are granted only for health reasons. If other reasons necessitate a request for a change in a final exam, the request must be submitted three weeks in advance of the examination.

Table 1: Preliminary Class Schedule

Week	**Week Starting**	**Chapter**	**Topic**
1	8/29	1	Relativity
2	9/5	1	Relativity
3	9/12	2	Relativity
4	9/19	3	Atoms
5	9/26 **(Exam 1 on Wed 9/28)**	4	Quantization of light
6	10/3	5	Quantization of atomic energy levels
7	10/10	6	Wave Particle Duality
8	10/17 **(Fall Break M & T)**	6	Wave Particle Duality
9	10/24	7	Schrodinger Wave Equation
10	10/31	7	Schrodinger Wave Equation
11	11/7 **(Exam 2 on Fri 11/11)**	8	3D Schrodinger Wave Equation
12	11/14	8	3D Schrodinger Wave Equation
13	11/21**(Thanksgiving W - F)**	9	Electron Spin
14	11/28	10	Pauli Exclusion Priciple
15	12/5	TBA	TBA
			Final Exam: Mon 12/12 at 2:00 PM