Introduction and Course Description
Physics 156-A Spring 2010

Information

Room 276. M 8-8:50, WF 9-9:50.

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Office Hours: M,T,Th 11 am-noon; Wed, Thu 1:30-3 pm and by appointment or if my office door is open.

Goals

This course introduces you to most of the fundamental concepts of classical physics, and is a continuation of Physics 155. A typical week includes three 50 minute classroom meetings and two 80 minute laboratory meetings. The classroom activities will include discussion, lecture, and a small amount of group work. Each week's laboratory meetings are structured so that the first focuses on concepts and equipment, while the second focuses on solving a problem.

There are two main goals to the course. First, is for you to gain a conceptual understanding of physics. The topics we will cover include gravity, waves, electricity and magnetism, electronic circuits, light and optics. We will use readings from the text, lecture, discussion and experimental exercises to help you construct a knowledge base of basic physical principles. A solid grasp of the fundamental concepts will enable you to succeed in the homework and exam portions of the course.

The second goal is for you to learn techniques to improve your problem solving abilities. As with Physics 155, problem solving will appear in both the discussion and laboratory parts of the course.

Mathematics

Mathematics tools we will use: vectors, differentiation, Taylor series approximations to functions and integration. Review of these topics would be beneficial. Integration is covered in Math 126, which is a corequisite for Phys 156. Therefore, I do not expect you know integration from the beginning, and will cover this in more detail than the other math tools.

Group Work:

For class and laboratory you will be working in groups, which will be determined at the beginning of the course. Part of your problem sets will be turned in as a group submission. A well functioning group permits all group members to learn. Group work is not intended to make learning easier, just more efficient - it is still hard work!! I expect you all to actively participate to make your groups function effectively.

Textbook & Lecture

There will be substantial overlap between the text and lecture. Please try to read the text before coming to class. A few topics won't be covered in lecture, but will still appear on problem sets and exams. I will list these topics in a file on CLEo. The reason for doing this is to build into the course activities that require you to learn things by reading the book. This can be challenging with some science textbooks, and I want you to develop this skill.

Assignments & Grading

Problem Sets: **Weighted 15%.**

Each week a problem set is due on Wednesday at 5 pm, consisting of individual and group problems.

Individual problems: 5-10 problems to be worked by yourself. These are posted on Webassign (http://webassign.net/) and are turned in online. You should have an account at Webassign with your Whitman email userid as both username and password (good idea to change your password after logging on). Institution = whitman. Each problem on Webassign may be submitted up to 5 times, therefore it is to your advantage to start these early in the problem set cycle, so you have time to think about the problem should your initial solution be incorrect.

Group problems: 2 problems solved as a group and written up using the problem solving strategy. One solution per group to be turned in by 5 pm on Wednesdays in the wooden boxes ouside the physics department offices. Group problem sets will be posted on CLEo (https://cleo.whitman.edu/). Also posted on CLEo is a strategy for problem solving, which may serve as a guide for group problem submissions.

Please note: There is absolutely no way to make-up problem sets. If you are going on a field trip or to a sporting event, you should to turn in your problem set before you leave. However, in order to accommodate for illness etc., I will drop your two lowest problem set scores in calculating your final grade.

Exams: **Weighted 70%.**

Midterms (in class; 15% each):	Feb 12 (Friday) March 12 (Friday) April 23 (Friday)
Final Exam (25%):	May 17 (Monday); 2 - 5 pm.

NOTE: If you have irreconcilable conflicts during the times that the midterms will be given it is your responsibility to let me know **at least 1 week in advance** of the midterm. The date of the final is set in stone and cannot be altered.

Laboratory: Weighted 15%-with the additional requirement that to pass the course you must achieve a minimal laboratory grade of 70%.
Details about the laboratory can be obtained from your lab instructor.

Special Note: ADA issues

Under the Americans With Disabilities Act, The College is required to make certain accommodations for individuals with a documented learning disability. Anyone who qualifies for these accommodations needs to speak with Clare Carson in Student Services. Arrangements for these accommodations need to be made with me IN ADVANCE of taking any exams (preferably at least 1 week in advance).

Course Schedule (Text is Physics for Scientists and Engineers, 1/e by Knight, available at the bookstore). The detailed schedule is approximate.

Week	Topic	Text Chapter	Lab #

Jan. 18[a] Gravity ..... 12,25 .....no lab
Mon: MLK day
Wed: Newton's Law of Gravity & Gravitational Fields
(Book sections 12.3-5, 25.6)
Fri: Gravitational PE (12.6 - excluding Kepler's laws)

Jan. 25 Charge and Coulomb's Law .....25.....1
Mon: Charge & Coulomb's Law (25.1-4)
Wed: Coulomb's Law & Fields (25.4-6)
Fri: Fields (25.6)

Feb. 1 The Electric field.....26.....2
Mon: Discrete charge distributions (26.1-2)
Wed: Continuous charge distributions (26.3-4)
Fri: Motion of q in $\vec{E}$; $\vec{E}$ in conductors (26.5-7)

Feb. 8[b] Electric Potential.....29.....3
Mon: Electric potential energy (29.1-3)
Wed: Electric potential (29.4-7)
Fri: Exam

Feb. 15[a] Potential-Field Connection .....30.....no lab
Mon: Pres Day
Wed: Potential <---> Field (30.1-2)
Fri: Batteries & Capacitors (30.4-7)

Feb. 22 Fundamentals of Circuits .....31.....4
Mon: Current, Resistance & Ohm's Law (30.5, 31.1-2)
Wed: Kirchoff's Laws & Circuits (31.3-10)
Fri: Electrical Power (31.3-10)

Mar. 1 Magnetic Fields.....32.....5
Mon: Intro to $\vec{B}$ (32.1-3)
Wed: Source of $\vec{B}$ (moving charge), cross products (32.3-5)
Fri: Magnetic Forces (32.7-9)

Mar. 8[b] Magnetic Fields.....32-33.....6
Mon: Magnetic Forces & Magnets (32.8-10)
Wed: Induced Currents (33.1-2)
Fri: Exam

Mar. 29 Magnetic Induction .....33.....7
Mon & Wed: Magnetic Flux, Faraday & Lenz (33.3-5)
Fri: Applications of induction (transformers, motors) (33.7)

Apr. 5 Electromagnetic Fields & Waves.....34.....8
Mon: Maxwell, electromagnetic waves & light (33 6, 34.7)

	Wed: Polarization (34.8)		
	Fri: $\vec{E}$ & $\vec{B}$ in moving reference frames (34.1-2)		
Apr. 12	Wave Optics	21,22	9
	Mon: Superposition & Interference (21.1, 22.1-2)		
	Wed & Fri: Diffraction (22.3-4)		
Apr. 19[b]	Wave & Ray Optics	22,23	10
	Mon: Inteferometry (22.6)		
	Wed: Light as rays, reflection (23.1-2)		
	Fri: Exam		
Apr. 26	Ray Optics	23.	11
	Mon: Reflection & Refraction (23.2-3)		
	Wed: Refraction & Dispersion (23.4-5)		
	Fri: Optical instruments (23.6-7)		
May 3	Light as Particles; Electrons as Waves	24.	12
	Mon: Spectroscopy & Diffraction (24.1-2)		
	Wed: Photons & Matter waves (24.3-4)		
	Fri: Flex day - relativity/review		
May 10	Review		practicum
	Mon: Flex day - relativity/review		

[a] Denotes a Monday-less week [b] Denotes that a Midterm exam will be held during this week.