Introduction and Course Description
Physics 156-A  Spring 2010

Information
Doug Juers, Science 244, 527-5229, juersdh@whitman.edu
http://www.whitman.edu/~juersdh
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 outside 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 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.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Text Chapter</th>
<th>Lab #</th>
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2 of 4
Jan. 18
Gravity ............................................................................ 12,25 ............... no lab
Mon: MLK day
Wed: Newton's Law of Gravity & Gravitational Fields
(Workbook 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
Electric Potential............................................................... 29 ................. 3
Mon: Electric potential energy (29.1-3)
Wed: Electric potential (29.4-7)
Fri: Exam
Feb. 15
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
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: Interferometry (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.