SYLLABUS

Physics 0111

Fall Term 2007 (Term 2081)

Dr. Steven Dytman

Note: The information in this printed syllabus will be found on the Web site maintained for this course under the CourseWeb address **http://courseweb.pitt.edu/**. If you are registered for the course, you will have access to this information. This website is the repository for almost all course information, e.g. weekly homework assignments, lecture notes, announcements, practice exams/solution, and any future revisions of this syllabus.

COURSE DESCRIPTION

The title of this course is *Introduction to Physics 2*. It is the second term of a two-semester lecture-demonstration sequence that introduces students to the basic elements of both classical and modern physics. The subjects covered in Physics 0111 are wave motion and sound, electricity and magnetism from electrostatics through electromagnetic waves, geometrical and physical optics, special relativity, and selected topics in modern physics. *This course sequence is especially designed for students who are interested in the life sciences or health-related professional fields*. Thus the emphasis will be on describing and demonstrating the underlying basic principles rather than on mathematical formalism. The correlation between material in this course and what is covered in the MCAT exam is excellent. Weekly homework problems are assigned to develop analytical skills and deepen understanding of the concepts. Students are expected to be familiar with elementary high school algebra, geometry, and trigonometry.

TEXTBOOK

The textbook for this course will be *Physics* by John D. Cutnell and Kenneth W. Johnson (**Seventh Edition**), John Wiley & Sons, Inc. (2007). This course will cover Chapters 16 through 32 of this book at a pace of approximately one chapter per week. The material in the text is very similar to the 5^{th} and 6^{th} editions, so I am not aware of any problem in using the earlier editions. Main changes are to the homework problems which won't be used.

LECTURES AND RECITATIONS

In addition to the three weekly lectures each student is expected to sign up for and attend one recitation session per week. The recitations are taught by a Teaching Assistant and provide students with the opportunity to ask questions about the lecture material or the homework and to work out sample problems in a small-group setting.

The lectures and recitation sessions for Physics 0111 are:

Physics 0111:	Day(s)	Time	Room	Instructor	CRN
Lectures	M,W,F	1:00-1:50 pm	343 Alumni Hall	S. Dytman	10745
	Mon	2:00-2:50 pm	102 Thaw Hall	Xiaohui Liu	10479
	Mon	3:00-3:50 pm	102Thaw Hall	Xiaohui Liu	10480
	Tues	11:00-11:50 am	319 Allen Hall	Xiaohui Liu	10481

COURSE OUTLINE

Chapter transitions are shown in brackets, e.g. [20] is where chapter 20 begins.
Caution: This outline is subject to modest adjustments as the course progresses.

Week #1	Aug 27-31	Lect 1-3: [16] Course overview and organizational details; Waves – types, mathematical description, speed of a wave on a string; sound waves – speed of propagation, intensity, the Doppler effect; Applications of sound waves; the human ear
Week #2	**Sept 3 (M)** Sept 5-7	**No Lecture – Labor Day** Lect 4-5: [17] Applications of sound waves; superposition and interference of waves; diffraction of waves; beats; standing waves;
Week #3	Sept 10-14	Lect 6-8: [18] Electrostatics – electric charge, electric force; Coulomb's law; the concept of electric field; calculating the electric field; Gauss' law; Applications of Gauss' law
Week #4	Sept 17-21	Lect 9-11: [19] electric potential energy; electric potential; equipotential surfaces and their relationship to the electric field; storing electric charge – capacitors and dielectrics; biomedical applications
Week #5	Sept 24- 28	Lect 12-14: [20] Moving electric charge – electric current, *emf*, resistance to current flow, Ohm's law; electric power; DC and AC; circuits with resistors in series and parallel; illustrative examples Capacitors in series and in parallel; RC circuits; illustrative examples;
Week #6	Oct 1-5	Lect 15-17: [21] permanent magnets – magnetic poles, fields, and forces; force exerted by a magnetic field on a moving charge; mass spectrometer; force exerted by a magnetic field on current-carrying wire; electric motor; speaker; Magnetic field produced by electric current; Ampere's law; applications;
Week #7	**Oct 8** Oct 10-12 **Oct 12**	**1st hour-examination (material covered in Lect #1 through #14)** Lect 18-19: [22] electromagnetic induction - magnetic flux, Faraday's law; Lenz's law; illustrative examples. **Note room change to *Scaife Hall Auditorium***
Week #8	Oct 15-19 **Oct 19**	Lect 20-22: Applications of electromagnetic induction – microphone, electric generator, transformers; [23] AC circuits with capacitance & inductance; resonance circuits; semiconductor devices; [24] electromagnetic waves – origin, speed of propagation, spectrum; energy of e.m. waves **Note room change to *120 David Lawrence Auditorium***

Week #9	Oct 22-26	Lect 23-25: Doppler effect; polarization; [25] reflection of light; images produced by flat and curved mirrors; [26] refraction of light; index of refraction, dispersion, total internal reflection; basic optics – formation of images by lenses
Week #10	Oct 29-Nov 2	Lect 26-28: Optical instruments – the human eye & eyeglasses, microscopes & telescopes; [27] the wave nature of light – interference & diffraction, applications; illustrative examples
Week #11	Nov 5-9	Lect 29-31: [28] Special relativity – moving reference frames, time dilation, length contraction, equivalence of mass and energy; experimental tests of effects predicted by theory of special relativity; [29] particles and waves – the wave-particle duality; blackbody radiation; pre-examination review
Week #12	**Nov 12 (M)** Nov 14-16	**2nd hour-examination (material covered in Lect #15 through #28)** Lect 32-33: Photoelectric effect & neutron diffraction; [30] structure of the atom – Rutherford scattering, line spectra, and the Bohr model of the hydrogen atom
Week #13	Nov 19 **Nov 21-23**	Lect 34: quantization of electron states, the Pauli exclusion principle **Thanksgiving holiday**
Week #14	Nov 26-30	Lect 35-37: the periodic table of the elements; lasers [31] The atomic nucleus – constituents, strong force, binding energy; isotopes; types of radioactive decay processes; half-life; carbon dating; radiation detectors; [32] biological effects of ionizing radiation, radiation treatments
Week #15	Dec 3-7	Lect 38-40: nuclear fusion and fission; elementary particle physics; astrophysics – energy generation in stars; the life cycle of stars; cosmology – the evolution of the universe; pre-final examination review of course material

Week #16	**Monday, December 10 12:00noon – 1:50pm (room to be announced)**	**Final Examination (all material covered in the course)**

LECTURER

Dr. Steven Dytman, Professor of Physics & Astronomy
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TEACHING ASSISTANT (TA)

Xiaohui Liu, Grad student in Dept. of Physics & Astronomy
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CONDUCTING THIS COURSE

In recent years research on the effectiveness of physics education has uncovered two surprising facts: (1) Many students leave high school with significant misconceptions about how the

physical world around them works; sometimes, students wonder why the world physicists see and the world they see are so different. Our goal here is to greatly improve your common sense, i.e. understanding how the (scientific) world works. (2) Conventional introductory physics courses in college that rely largely on the transmission of information in the traditional lecture format are quite ineffective, regardless of the lecturer, in making the students give up these misconceptions and replace them with correct ones. This research has also shown that a better way to get students to understand the important physics concepts correctly is to involve them actively during the lectures, forcing them to test the concepts they hold against experimental evidence. And students who have learned the correct conceptual framework will also discover that there is a more reliable and satisfying way to solving physics problems correctly than the "plug and chug" approach that relies on memorizing formulas.

The course will be set up with these findings in mind. The pace of new material is set by your departments, not mine. That pace will require both you and me to cover ground quickly. **I will assume you read over appropriate material before the class**; if you don't, the lecture will make less sense. The Concepttests in class will allow us to assess progress quickly. Homework, recitation quizzes, and exams will also assess progress.

The hard fact is that if you want to succeed in this course you must not only attend all lectures and recitations, but also spend at least 8 additional hours each week reading the textbook and doing the assignments.

HOMEWORK

Experience has shown that the best way to make sure that you really understand the concepts presented in this course is to apply them to a number of different situations. Therefore a weekly homework assignment consisting of conceptual questions and numerical problems will be given. The goal is to have all homework on the web. We will use lon-capa, a powerful tool started at Michigan State University. You will log in to a web site: http://nplq1.phyast.pitt.edu each time you work on homework. The first time you log in, use your Pitt username and Peoplesoft ID to log in. You can change the password in Preferences. Each assignment will have a particular time window in which work can be done. The first assignment each week will be due Thursday at 1am and will cover the Monday and some aspects of the Wednesday lectures; the second assignment will be due Monday at 1am and will cover the remaining material. During most recitation sessions the TAs will give a short quiz that will be based on the homework assignment due the previous week. These quizzes will also be graded.

The following table lists the sections of the book and which days homework is due each week.

WEEKLY READING AND HOMEWORK ASSIGNMENTS

WEEK	READING	HOMEWORK
#1	Chapter 16 (Sect. 16.1 – 16.9)	Sept. 1 (time is always 1am)
#2	Chapter 16 (Sect. 16.10 – 16.11) All of Chapter 17	Sept. 6, 10,

#3	Chapter 18 (Sect. 18.1 - 18.9)	Sept. 13, 17
#4	Chapter 18 (Sect. 18.10 – 18.11) All of Chapter 19	Sept. 20, 24
#5	Chapter 20 (Sect. 20.1 – 20.10)	Sept. 27, Oct. 1
#6	Chapter 20 (Sect. 20.11 – 20.15) Chapter 21 (Sect. 21.1 – 21.6)	Oct. 4, Exam 1 Oct. 8
#7	Chapter 21 (Sect. 21.7 – 21.10) Chapter 22 (Sect. 22.1 – 22.5)	Oct. 11, 15
#8	Chapter 22 (Sect. 22.6 – 22.10) All of Chapter 23 Chapter 24 (Sect. 24.1 – 24.4)	Oct. 18, 22
#9	Chapter 24 (Sect. 24.5 – 24.7) All of Chapter 25 Chapter 26 (Sect. 26.1 – 26.8)	Oct. 25, 29
#10	Chapter 26 (Sect. 26.9 – 26.15) All of Chapter 27	Nov. 1, 5
#12	All of Chapter 28 Chapter 29 (Sect. 29.1 – 29.2)	Nov. 8, Exam 2 Nov. 12
#13	Chapter 29 (Sect. 29.3 – 29.7) Chapter 30 (Sect. 30.1 – 30.3)	Nov. 15, 19
#14	Chapter 30 (Sect. 30.4 – 30.11)	Thanksgiving
#15	All of Chapter 31	Nov. 29, Dec. 3
#16	Chapter 32 (Sect. 32.1 – 32.8)	Dec. 6

STUDY ASSISTANCE

Regular attendance at the lectures and recitations is assumed. Students who need additional help are strongly encouraged to see the lecturer and/or their recitation instructor during their regular office hours (listed on the Web site) or make an individual appointment at a mutually convenient time.

The Department of Physics and Astronomy has also set up a **Resource Room** and **Exploration Center** for the benefit of the students in the introductory courses. They are both accessible through Room 312 on the third floor of Thaw Hall. The times during which the Resource Room will be staffed by a Teaching Assistant will be announced as soon as the scheduling arrangements have been completed. The simple laboratory set-ups that are provided in the Exploration Center during the course resemble the lecture demonstrations and are selected to help you develop a hands-on understanding of the key concepts presented in the lectures. You are strongly encouraged to experiment with them. Do suggested work and get extra credit (1 homework per experiment).

EXAMINATIONS

There will be two written hour-examinations (each 50 minutes long) during the term. ***Dates are October 8 and November 12***. Both scores will be used in the calculation of your final course

grade. Like the homework assignments, these examinations will consist of conceptual questions and numerical problems in roughly equal proportion. The final examination will be given on ***December 10***, see *http://www.pitt.edu/~registrar/crinFinalExam.htm*. **Make-up examinations will be given only in extreme situations.**

LATE WORK AND MISSED EXAMINATIONS

As a general rule, assignments turned in after the specified deadline and missed examinations will be given zero points. Exceptions may only be made at the lecturer's discretion in documented cases of unforeseen circumstances that were clearly beyond the student's control. Such circumstances must be brought to the lecturer's attention as soon as they develop, whenever possible **before** the deadline or test.

COURSE GRADE

Your final course grade will be determined with a simple formula:

(1) Your lecture concept test scores (5%)
(2) Your attendance and participation in the recitation sessions, scores on the homework, and your recitation quiz scores (10%)
(3) The sum of your scores on the two hour examinations (50%)
(4) Your score on the final examination (35%).

Your final course score will be the weighted average of this information. The translation of your overall course score into a final letter grade will take into account the class average and the distribution of the overall course scores achieved by the entire class tempered by my teaching experience.

SPECIAL ACCOMMODATIONS FOR DISABILITY

If you have a disability that requires special testing or other accommodations, you need to notify both the instructor and the Office of Disability Resources and Services no later than the 2nd week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. The Office of Disability Resources and Services is located in the William Pitt Union, Room 216. Call 648-7890 (Voice or TDD) to schedule an appointment.

ACADEMIC INTEGRITY

All students and instructors in this course are expected to follow the University of Pittsburgh academic integrity guidelines. If you are not aware of the specifics, you should obtain a copy of these guidelines from the CAS Dean's Office, 140 Thackeray Hall, or look them up on page 9 of the CAS publication "*First-Year Viewpoint, 1999-2002*" or on the College of Arts and Sciences

Web page. Violations of these guidelines by a student may result in a zero score for an examination or a failing grade for the entire course.