P221: Physics I
Fall 2005

COURSE INFORMATION

Instructors: Prof. Dobrin Bossev
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(Course Secretary: Ms. Donna Martin, Swain West 132, Phone: 855-2785, e-mail: djmartin@indiana.edu)

Professors Shepherd and Bossev will alternate as lecturer and discussion section instructor. The schedule of alternation is indicated on the class syllabus sheet.

Office Hours: Lecturer: MWF 2:30 – 3:45 pm
Discussion Instructor: TR 10:00 – 11:00 am
Meetings at other times can be set up by appointment. Students can also take advantage of the Physics Forum available daily in SW 246 (temporary in the reading room of Swain Hall library).

Enrollment: You must be enrolled simultaneously in the lecture section, plus one of the three Discussion sections, plus one of the four Laboratory sections listed below.

Lectures:	Section #20561	Swain West 007, MWF	1:25 – 2:15 pm
Discussions:	Section #20562	Swain West 219, TR	8:00 – 8:50 am
	Section #20563	Swain West 219, TR	9:05 – 9:55 am
	Section #20564	Swain West 220, TR	11:15 am – 12:05 pm
Laboratories:	Section #20565	Swain West 150, R	11:15 am – 1:10 pm
	Section #20566	Swain West 150, R	1:25 – 3:20 pm
	Section #20567	Swain West 150, R	3:35 – 5:30 pm
	Section #20569	Swain West 150, R	9:05 – 11:00 am

Text: *Fundamentals of Physics* (7^{th} ed.) by Halliday, Resnick and Walker

References: Books on reserve in the Swain West Library:

The following three books are roughly comparable in coverage and depth to Halliday, Resnick and Walker (HRW):

1. *Principles of Physics* by Serway
2. *Physics* by Ohanian
3. *Physics for Scientists and Engineers* by Giancoli

The next two books explore the physics in greater depth than HRW:

1. *Feynman Lectures on Physics, vol. 1* by Feynman, Sands and Leighton (based on a famous course taught by Feynman at Caltech)
2. *Newtonian Mechanics* by French (extended discussion of classical mechanics)

Drop & Add: Section changes among P221 labs and discussions can be made in one of two ways:

1. Students can find another student in the course who wishes to switch sections with them. Both students should then go to SW132 together and produce schedule confirmations showing the section numbers they are currently enrolled in, to confirm that these are direct switches. This must be done during the first week of classes, August 29 – September 2.
2. Students who cannot find another student for a direct switch may follow normal drop and add procedures, if space is available in the section the student wants to add.

Students who drop or add the complete P221 course must do so by normal drop and add procedures.

Withdrawal: The last date by which to withdraw from the course with an automatic grade of W is Wednesday, October 26, 2005 (no later than 4:00 p.m.).

COURSE POLICIES

Prerequisites: You should be currently enrolled in Mathematics M211, or you should have completed this course or its equivalent in introductory calculus. No prior physics course is required.

Homework: There will be weekly problem sets assigned throughout the semester. The homework each week will be due on Friday by 1:00 pm, i.e., just **before** the Friday lecture. The assigned problems will be posted on the course website (see below) at least one week in advance of the due date (except for the first assignment, which will be handed out at the first lecture). The homework is to be turned in at the bin designated for P221/Bossev in the hallway outside SW132. We encourage you to work on the problem sets with your classmates since this is likely to enhance your comprehension. Also, some of the homework problems will be discussed before the due date in the discussion sections. *However,* each student must turn in his/her own solutions. *No late homework will be accepted.* A few of the problems from each homework set will be selected for grading. **If** you turn in **all** of the homework assignments for the semester, then the lowest of your 14 homework grades will be dropped in computing the final course grade. After the homework is collected each week, solutions will be posted in the display cabinets designated for P221.

Website: A website for the course will be maintained through the IU Oncourse facility, at the following url: https://oncourse.iu.edu/ On it will be posted course information, policies, syllabus and schedule; homework assignments and solutions for homework handed in previously; quiz and exam solutions; grades for homework, quizzes and exams (viewable only for the individual student who logs on); dates and times for review sessions; etc.

Quizzes: Seven 15-minute quizzes will be given during Friday lecture periods, according to the schedule indicated on the course syllabus. Each quiz will consist of a single (possibly multi-part) problem or short-answer questions covering the same material as the homework set that was due that day. The quizzes are intended to help you keep up with the material and to give you practice (and feedback) at working the type of problems that will appear on exams. **If** you take **all** seven quizzes, then the lowest of your quiz grades will be dropped in computing your final grade.

Exams: There will be three in-class exams and a final exam, as indicated on the course syllabus sheet. The exams will consist of written problems and short-answer questions, analogous to those on the quizzes. The final exam will test your cumulative comprehension of concepts and techniques developed throughout the entire course. Roughly 40% of the final exam will cover material treated **after** the third in-class exam, while the remaining 60% will comprise problems like those on the earlier exams and quizzes covering earlier course material. Makeup exams will not normally be given. In exceptional cases where a valid medical or other excuse for missing an exam is established, an *oral* makeup exam may be considered.

Labs: The schedule of lab experiments is indicated on the course syllabus sheet and in the laboratory manual. Dan Beeker, who coordinates the labs for the Physics Department, will provide us with your cumulative lab scores, which will then be figured into your final course grade. Makeup labs cannot be arranged after the week in which they are scheduled, since the relevant equipment will all be disassembled by then. See the lab manual for more details concerning lab grading policies.

Discussion: Discussion sections will meet twice weekly, with the major purpose of helping you to develop your problem-solving skills and critical thinking. Each section will be divided into groups of 4-5 students each, and each group will work together on solving some of the problems from that week's homework assignment or similar problems. A representative from several of the groups will be chosen to make an oral presentation of the group's solution to a selected problem. The presenter will also be expected to address questions from the other students and from the instructor concerning the solution, conceptual issues underlying it, how the problem would change if certain input specifications were altered, etc. This exercise will help to train you to ask yourself pointed questions in order to assess whether you really understand both the techniques and the implications of a problem solution. *Each student* in the class will be expected to make a few such presentations during the course of the semester, and these will form the basis of your discussion grade.

Grades: Final grades will be based on your scores on exams, quizzes, homework assignments, lab reports and discussion presentations. The relative weighting of each of these contributions in the final grade is as follows:

Three in-class exams	30%
Final Exam	20%
Six Quiz Grades	12%
Thirteen Homework Grades	13%
Labs	15%
Discussion	10%
Total	100%

Posting: Homework, quiz and exam solutions, as well as grade distributions, will be posted in glass cases on the first floor of Swain West, as well as on the course website.

COURSE OBJECTIVES

Physics I, II, and III (P221, P222, and P301) form a three-semester course introducing those central topics in classical and modern physics that form the basis for all of our attempts to understand quantitatively the physical behavior we observe in the world around us. In particular, Physics I introduces one of the great classical contributions to physics: Newtonian mechanics. The ideas that have resulted from Newton's Laws and the consequent conservation principles form the basis for all of contemporary physics. This is true even though 20^{th} century research exposed regimes (the very small, the very fast) where Newton's Laws must be modified (by Quantum Mechanics and/or Relativity) for a proper treatment of observed phenomena.

In addition to introducing you to the concepts and laws of classical mechanics, we hope in Physics I to help you to develop an array of skills and techniques needed to appreciate what physicists do and how they do it. There will be a heavy emphasis on the quantitative application of physical laws to solving problems. These applications will often demand that you make concrete use of calculus and other mathematics that you may have learned previously in a more abstract approach. We hope that the concrete applications will enhance your fluency in and appreciation of the mathematics.

You will also have the opportunity to perform simple laboratory experiments that serve several purposes: to demonstrate some of the concepts covered in the lectures; to expose you to techniques required to make reliable measurements and estimate their uncertainties; to give you some appreciation for the interplay between experiment and theory in science. In the laboratory, the discussion sections, and the homework you will be encouraged to develop collaborations with other students. Such collaborative efforts are central to physics research, and should help you to understand the relationships among different approaches to the same problem, and the invaluable stimulation offered by give-and-take in searching for solutions.

Meeting all of the above objectives of this course will demand a lot of work on your part. It is essential that you keep up with the work, because each topic introduced, each skill taught, will build upon all those developed earlier in the course. If we do our jobs well, then all of this work should be accompanied by a lot of fun, intellectual challenge, and learning.