

PH 101: Essentials of Physics

Fall 2006

Room: CH 371

Class Meeting: TR, 1200-1350h

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Office hours: W, 1030-1230h. If this time does not work for you, please contact me to arrange a meeting.

Text: Conceptual Physics, Paul G. Hewitt, Pearson/Addison Wesley, 10th Edition.

Physics exists because there is order to the Universe. Without this order, we would exist in a very strange world where what happens now would have no effect on what happens next, where time and space would cease to flow smoothly, and where it would be difficult if not impossible for life to occur. For better or for worse our Universe is organized, at least on scales accessible to human senses. Physics is an attempt to describe this order, to organize our observations into patterns, and to ultimately understand why order should exist at all. If these patterns are to be meaningful they must be able to predict future events. If they don't, they are of limited use and should be discarded so a new organization of the observations can be made.

These patterns of course are the underlying laws of physics; $F=ma$, $E=mc^2$, and so on. Why they exist is a mystery. In this class we wish to examine and study these patterns, to understand how they help organize our observations, and to see what new and interesting predictions they can make. We will take a conceptual approach, and leave much of the numerical problem-solving behind, though we should understand that the mathematical laws can help guide our thinking.

Though physics isn't necessarily more difficult than any other subject, it takes time and practice to fully integrate the patterns into our thinking. The best way to get this practice is by working through the exercises and problems at the back of each chapter. Many students fall into the trap that reading the chapter text alone is sufficient to understand physics. It is possible to read through the chapter and understand it, but still be unable to interpret and apply the chapter material. It is much like reading a novel and understanding the prose and dialogue without realizing the underlying literary themes and metaphors. Do as many exercises as you can.

The components of the class work are meant to help guide your learning experience. Homework problems give you time to think more deeply and fully about the concepts, quizzes allow you to quickly process material that you have learned in recent lectures, group work gives you a chance to increase your understanding either by teaching others or learning from others, and finally exams are the culmination of your studies, where you successfully apply what you learned to novel observations.

Another problem with physics is the language. Terminology in physics may have different meanings than how we use it in everyday conversation. For example, in common-use, we tend to interchange the words velocity, speed, momentum, and inertia. In physics each of these has a precise meaning. Much of the challenge is to "unlearn" our preconceived definitions and replace them with the physical definitions.

Some goals of this course include (in no particular order):

- To understand what the study of physics is.

- To understand the successes and limitations of physics.
- To see physics in everyday life and around you.
- To understand how and why things move.
- To understand the role of physics in the technological and natural world.
- To understand how physics can change one's worldview.
- To understand Newtonian physics.

Material covered: This term will cover roughly chapters 1 through 14, that is all of Parts I and II in the text. This includes mechanics and properties of matter.

I will be going sequentially through the text. You should base your readings on what was covered in the previous lecture. Students who do well in the course are often those who have read ahead and come prepared with questions and comments. There may be no better advice than doing the reading before the lecture so you are an active participant rather than a passive observer.

WebCT: If you are enrolled in the course, you will automatically have access to the course's WebCT site. Log in to the site at psuonline.pdx.edu. Type in your ODIN username and password for access. The WebCT site will be mainly used as a repository for class materials and announcements. Make sure to check it often. Also there is a discussion board that can be used to communicate with your fellow classmates. I encourage you to do so. I will check the discussion board periodically to answer questions/concerns that are raised but if you want an immediate answer from me to your question, please email me directly.

Lecture notes – Available online at the library's course reserves. These can be accessed through WebCT or directly through the library website: www.pdx.edu/library. Go to <Course Reserves>, then search for the class either by number, name, or instructor. The password is <butenhoff>, without brackets. Please allow a day before the notes appear online.

Homework – You have the option of doing problem sets to offset some of the weight of the exams. If you feel you can do well on the exams without the added time spent thinking through the homework exercises, you can choose the non-homework track. In this case the total exam weight is 60% of your final grade. If you choose to do homework, the exams will be 40% of your total grade, and homework will be 20%. There is no penalty for doing homework. If at the end of the term your homework grade is lower than your exam grade, I will dismiss your homework and use your exam grade at the 60% weight. To reduce the grading burden, please refrain from turning homework if you are not on the homework track. Problem sets will be assigned each Thursday and will be due the following Thursday at the beginning of class. Late homework will be accepted up until the Tuesday after the due date at a 10% penalty. No homework will be accepted after this. Only excused absences will negate this policy. I will drop your lowest two scores.

Quizzes – There will be short (10-15 min) quizzes every Tuesday. These will be based on material presented in the lectures since the last quiz. There will be a total of seven quizzes and I will drop your lowest two quiz scores. You will need a Scantron for these (each Scantron can be used for two quizzes, front and back). You will not be given extra time to do the quiz if you arrive to class late, so please ensure you arrive to class punctually on quiz dates.

In-class group exercises – We will frequently break up into small groups and work collaboratively on a set of problems, exercises or discussions on an in-class demonstration. The purpose of this is to open lines of communications amongst your peers and to learn from one another in an informal setting. At the end of each session you will submit your collective group

responses to the questions provided. All members in the group will receive the same score on the work. You will automatically get half credit just for participation in the group exercise. The other half will be based on your solutions to the problems.

Exams – There will be a total of three exams - two midterms and the final. The final exam is comprehensive with an emphasis (~60%) on the material covered after the second midterm. You may drop the lower of your two midterm grades, and if you are satisfied with your first midterm score, you are not required to take the second midterm. The exams are closed book but you may have one sheet of notes, front and back, during each exam. Please bring a Scantron to ease the grading burden.

Extra credit – You have the opportunity to write an essay that is worth up to six additional percentage points, which will be added to your final adjusted score. I will provide a list of suitable topics and more details later in the term. This will be due on the final exam date.

Email - Please ensure that I have a working email address for you. Many important class announcements are given this way.

Respect and Fairness: Please be courteous and conscientious towards your fellow classmates. This would include simple things like turning off your cell phone before class, refraining from distracting conversations during class, and actively participating in group activities. I have no problem with you working on outside class work during lecture, as long as it doesn't disturb others. Finally, I try to apply a fair and consistent standard to all students. If you feel some element of the class doesn't conform to this, please discuss it with me.

Point Distribution

Track I (No homework):

| | |
|-----------------------|----|
| Midterm (Best 1 of 2) | 30 |
| Final | 30 |
| Quizzes (Best 5 of 7) | 25 |
| Group work | 15 |

Track II (Homework)

| | |
|------------------------|----|
| Midterm (Best 1 of 2) | 20 |
| Final | 20 |
| Homework (Best 6 of 8) | 20 |
| Quizzes (Best 5 of 7) | 25 |
| Group work | 15 |

Grading:

| | |
|--------|----|
| 100-90 | A |
| 80-89 | B |
| 70-79 | C |
| 60-69 | D |
| <60 | F. |

“+” for top three percentages in each range

“-“ for bottom three percentages in each range

If the class average is less than a middle C (75), all scores will be adjusted upwards to meet this criterion.

Extra Credit will be added after all grades have been adjusted.

Please Note: Final grades are final. To be fair to the whole class, after final grades have been submitted, you will not be allowed to do extra work to improve your grade.

Tentative Schedule

| Week of | Quiz/Exam | Readings | Due |
|----------------|-----------------------------------|-----------------|--------------------|
| 25-Sep | | Ch 1-2 | |
| 2-Oct | Quiz 1 (T) | Ch 3-4 | HW1 (R) |
| 9-Oct | Quiz 2 (T) | Ch 4-5 | HW2 (R) |
| 16-Oct | Quiz 3 (T), Midterm I (R) | Ch 6 | HW3 (R) |
| 23-Oct | No Quiz | Ch 7-8 | HW4 (R) |
| 30-Oct | Quiz 4 (T) | Ch 8-9 | HW5 (R) |
| 6-Nov | Quiz 5 (T) | Ch 9-10 | HW6 (R) |
| 13-Nov | Midterm II (T) | Ch 10 | HW7 (R) |
| 20-Nov | Quiz 6 (T) | Ch 11, 13 | |
| 27-Nov | Quiz 7 (T) | Ch 13-14 | HW8 (R) |
| 7-Dec | Final Exam , 1015-1205 (R) | | Extra Credit Essay |

T=Tuesday, R=Thursday

Important dates:

Oct 1: Last day for 100% refund for dropped classes.

Oct. 19: Midterm 1.

Oct 22: Last day to drop class.

Oct 27: Last day to change grading option.

Nov 14: Midterm 2.

Nov 17: Last day to drop class with instructor approval.

Nov 23: Holiday! No class.

Dec 7: Final Exam, 1015-1205, Same room.