



# PH102: Essentials of Physics

## Winter 2008

*"The most incomprehensible thing about the universe is that it is comprehensible."*

*-- Albert Einstein*

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**Office hours:** W, 1330-1530, or by appointment.  
If this time does not work for you, please contact me to arrange a meeting.

**TA:** Alec Sithole

**Room:** SB2 101

**Class Meeting:** TR, 12:00-13:50h

**WebCT:** <http://webct.pdx.edu> . If you are pre-registered, you are automatically added to the WebCT site, otherwise email me your ODIN username.

**Text:** Conceptual Physics, Paul G. Hewitt, Pearson/Addison Wesley, 10<sup>th</sup> Edition. (Older versions are fine, but be aware HW problems are taken from the 10<sup>th</sup> edition)



## WELCOME!

In physics we undertake the eternal quest of discovering how the Universe works, what rules it follows, what organizing principles it obeys, and of what stuff it is composed. This does more than simply satisfy our curiosity, like a child opening up a toy train discovers its inner gears and motors; in many ways this pursuit creates our notion of the Universe. It creates a model of what's "out there", of reality. In this light the pursuit of physics is more than just a means to build better mousetraps or to understand the rainbow's colors, physics can and does influence how we view the world and our place in it. As such it's a vital branch of knowledge not just to scientists and engineers but to all curiosity-seekers and armchair philosophers.

The first term of this class (PH 101) focused primarily on classical mechanics, how and why things move as determined by Galileo, Newton, and others, and outlined in Newton's three laws of motion plus his law of gravity. These are the laws of physics discovered primarily in the sixteenth and seventeenth centuries. The laws describe motion at everyday scales such as baseballs thrown through the air and planets orbiting about stars. They remain valid today at these scales, despite being insufficient to describe motion at microscopic scales.

The nineteenth century saw an advancement in numerous fields of physics. We began to understand the nature of the atom, heat was understood to be a form of energy, electricity and magnetism were united into a single force, and light was revealed to be a mixture of electric and magnetic fields. These advances led to what is sometimes called the second revolution in physics, the development of the laws of relativity and quantum mechanics in the twentieth century.

We will tackle a number of topics this term; states of matter, heat and thermodynamics, waves, electricity and magnetism, and an introduction to quantum physics.

### Difficulties:

Though we are modern people, in many ways we view the world as the ancients did. We have misconceptions about basic physical concepts from our common everyday experiences. It took human thought over two thousand years to change this view. You'll be asked to do it in ten weeks. It takes time and practice to fully integrate these new concepts into our thinking. We don't have much time so you'll need to practice. My advice is to work through as many exercises and problems at the end of each chapter as you can.

Many students believe that simply reading the chapter text alone is sufficient to understand physics. It isn't, so please don't fall into this trap. On quizzes and exams you won't simply be regurgitating chapter text, rather you'll be applying the concepts to novel problems.

Another difficulty 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 use such words as power, voltage, and energy interchangeably. In physics each of these has a precise meaning. Much of the challenge is to first “unlearn” our preconceived definitions and replace them with the physical definitions.

### **Learning goals:**

- To appreciate physics as a way of knowing the Universe.
- To gain knowledge of some of the basic fields of physics.
- To recognize as essential the role of energy in the Universe.
- To integrate basic physics concepts into your everyday life.
- To understand the need for a new physics in quantum mechanics.
- To be aware of some of the current areas of physics research.

**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 [webct.pdx.edu](http://webct.pdx.edu). Let me know if you do not have access to the course. The WebCT site is a repository for class materials and announcements. Make sure to check it often.

The discussion boards on WebCT can be used for communication with your fellow classmates on a variety of topics, and we'll also make use of the discussion boards for extended conversation on chosen topics. Participation in these discussions counts toward extra credit. See the extra credit section below.

Though I will check the discussion boards periodically, do not use it for communication with me. Use WebCT mail instead.

**Participation:** Educational research shows that passively listening to a lecture (esp. a 2 hr lecture) is one of the least effective ways to learn new material. Classroom time is better spent discussing and being actively engaged and participating. This requires commitment on your part to read the text before coming to class. Please do so.

In an attempt toward more active learning, I will intersperse lectures with activities that will allow you time to practice short problems both by yourself and with others. These activities will include “think/pair/share” questions and group work. I will pose the question to the whole class, then individually you first think about the correct answer and write down your response, then pair up with your neighbor and share and discuss your answers.

At other times we will divide up into small groups of three or four to work on problems collectively. None of these exercises will be graded, but they are used toward your participation grade.

**Quizzes:** There will be short (10-15 min) quizzes every week. These are a good way for you to keep up-to-date with the material and for me to assess class comprehension. It also helps alleviate some of the stress placed on the exams. The quizzes will be based on material presented in the lecture and text since the previous quiz. Please bring Scantrons to these to ease the grading burden. The quizzes are given at the beginning of class and *no allowance will be made for late arrivals*. I will drop your two lowest quiz scores.

**Exams:** There will be one midterm and the final. Exams will contain both multiple-choice and short answer questions. The final will be comprehensive with an emphasis on the material covered after the midterm. You are allowed to use one sheet of notes --- front and back --- for the exams and a calculator. You are responsible for all specified material in the text and lectures.

**Lecture notes:** These will be available online through the Course Reserves at the library website: [www.pdx.edu/library](http://www.pdx.edu/library). Go to *Course Reserves*, then type PH102 into the search engine. The password needed to access the material is my last name *Butenhoff*. It usually takes a day after the lecture for the notes to appear online so it's a good practice to take notes during class. There is also a link to the lecture notes from the WebCT site.

## Extra Credit –

**Presentation (2 pts)** – About a 10-minute presentation at the beginning of the class. Your presentation should draw from one of three areas below:

*New physics:* Current research in physics

*Physics of everyday life:* Application of the physics we'll learn in class to everyday activities/phenomena

*Demonstration:* A demonstration of the physics we'll learn in class. Feel free to be creative with this.

Presentations are limited to one per day. Let me know in advance when you wish to do yours. The calendar will fill-up on a first-come, first-served basis. Better sooner than later.

**WebCT Discussion (2 pts)** – Throughout the term I will post a number of topics on the WebCT discussion board. You can engage in this conversation for extra credit. You can earn up to two points if you post a total of ten times throughout the term. Your responses need to be at least a few sentences each.

**Homework problems (5 pts)** – Homework problem sets will be assigned roughly every other week. You can turn these in for extra credit.

**Absences** - To establish a fair make-up policy, only officially excused absences will be allowed the opportunity to do missed work. These include doctor-excused illnesses or family emergencies. Missing an assignment due to work or other conflicting appointments are not valid absences. If you think you will miss a significant amount of classtime due to work, please be aware of this policy.

**WebCT Mail:** Most announcements and communications will be through WebCT. Please check the site often for updates.

**Respect:** You can do some simple things to ensure that everyone in class has the best opportunity to learn and do well. Please turn off cell phones before class, refrain from unnecessary conversations with others, refrain from listening to music, watching videos, or playing games during class. Above all please treat others with respect. We all enter the classroom with different skills and experiences. I'd like to have a classroom that is welcoming to all.

## TENTATIVE SCHEDULE - See WebCT for up-to-date schedule

### Week of:

<b>Jan. 8, 10</b>		Review Ch 1-10	Nature of Science/Review of Mechanics
<b>Jan. 15, 17</b>	Quiz #1 (T)	Ch 11 (32),13	The Atom, Liquids
<b>Jan. 22, 24</b>	Quiz #2 (T)	Ch 14,15	Gases, Heat
<b>Jan. 29, 31</b>	Quiz #3 (T)	Ch 16,17	Heat Transfer, Phase change
<b>Feb. 5, 7</b>	Quiz #4 (T)	Ch 18,19	Thermodynamics, Waves
<b>Feb. 12, 14</b>	Midterm (R)	Ch 20	Sound
<b>Feb. 19, 21</b>	No quiz	Ch 22,23	Electrostatics, Currents
<b>Feb. 26, 28</b>	Quiz #5 (T)	Ch 24,25	Magnetism, Induction
<b>Mar. 4, 6</b>	Quiz #6 (T)	Ch 29,30	Light waves, Emission
<b>Mar. 11, 13</b>	Quiz #7 (T)	Ch 30-32	Quantum physics
<b>Mar. 20</b>	Final (R)	10:15-12:05	Comprehensive with emphasis on material since Midterm.

**Point Distribution**

Midterm	30
Final Exam	35
Quizzes (drop two)	25
Participation	10

**Extra Credit**

Presentation	2
Discussion	2
HW	5

**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

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

Final Grades are final. No extra work can be done after grades are submitted to better your grade.

**Important dates:**

Jan 13.: Last day for 100% refund for dropped classes

Feb. 3: Last day to drop class.

Feb. 22: Last day to change grading option.

Mar. 20: Final