



# PH101: Essentials of Physics

## Fall 2007

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

*-- Albert Einstein*

**Instructor:** Chris Butenhoff

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

**TA:** Aida Biberic

**Room:** CH 371

**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.

This is primarily a course on classical physics. Those concepts that were laid down in the sixteenth and seventeenth centuries that overturned two thousand years of prior human knowledge and changed the way future people would think about their world. Some recognize this advancement as the greatest human achievement in science. But we will also take small steps into what is called the second scientific revolution that occurred at the beginning of the twentieth century with the development of relativity and quantum mechanics. This second revolution is perhaps even more profound than the first but is more subtle as it operates on scales not normally accessed by human experience. In this term we will tackle relativity, both special and general and leave quantum mechanics to the Winter term.

### 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 velocity, speed, momentum, and inertia, 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 understand how and why things move in our everyday world.
- To appreciate the revolutionary nature of classical physics.
- To recognize some of the limits of the use of physics to understand the world.
- To understand the scientific method and see it as one way of knowing.
- To integrate basic physics concepts into your everyday life.
- To understand how relativity changed our notion of space and time.
- 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 PH101 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.

**Homework:** We will have four to five homework sets throughout the term. Typically these will consist of conceptual-style, short answer questions. I will drop your lowest score. No late homework will be accepted.

## 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 (3 pts)** – Every other week I will post a new (hopefully) thought-provoking topic on WebCT. To gain extra credit you are encouraged to participate in an online discussion of these topics. The topics will be chosen to either continue in-class discussions or to introduce new areas of inquiry. For full credit you'll need to contribute at least three posts for each discussion. The posts need to be non-trivial in content. Your posts can be reactions to points raised by others or your own ideas. Feel free to recommend topics to me.

**Miscellaneous assignments (2 pts)** – Throughout the term I will occasionally throw out small extra credit writing assignments or exercises.

**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>Sep. 25, 27</b>		Ch 1, 2	Intro/Sci. method/Worldviews/Old physics/Inertia
<b>Oct. 2, 4</b>	Quiz #1 (T)	Ch 2, 3	Forces/Equilibrium/Free fall/Kinematics
<b>Oct. 9, 11</b>	Quiz #2 (T)	Ch 4	Newton's 2 <sup>nd</sup> law, Weight, Friction
<b>Oct. 16, 18</b>	Quiz #3 (T)	Ch 5, 6	Newton's 3 <sup>rd</sup> law, Impulse-Momentum
<b>Oct. 23, 25</b>	Quiz #4 (T)	Ch 7	Energy
<b>Oct. 30, Nov 1</b>	Midterm (T)	Ch 8	Circular & rotational motion/Torques
<b>Nov. 6, 8</b>	No quiz	Ch 8	Centrifugal forces/Angular momentum
<b>Nov. 13, 15</b>	Quiz #5 (T)	Ch 9-10	Gravity/Tides/Escape velocity/Projectile motion
<b>Nov. 20, 22</b>	Quiz #6 (T)	Ch 35	Reference frames/Special relativity
<b>Nov. 27, 29</b>	Quiz #7 (T)	Ch 36	General relativity
<b>Dec. 6</b>	Final (R)	10:15-12:05	Comprehensive with emphasis on material since Midterm.

**Point Distribution**

Midterm	25
Final Exam	30
Quizzes (drop two)	20
Participation	10
Homework	15

*Extra Credit*

Presentation	2
Discussion	3
Misc.	2

**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:**

- Sep. 30: Last day for 100% refund for dropped classes
- Oct. 21: Last day to drop class.
- Nov. 9: Last day to change grading option.
- Nov. 22: Holiday. No class.
- Dec. 6: Final