 Essentials of Physics  

PHYS 102 - Spring 2004  

http://physics.uoregon.edu/~torrence/102/  

Updated 3/28/04  

Syllabus | Lectures | Homework | ILD | MiniLab | RWP | Blackboard  

| Instructor | Prof. Eric Torrence | Willamette 418, 346-4618  

| Teaching Assistant | Matthew Fairbanks | torrence@physics.uoregon.edu  

| Class | MUWF: 14:00-14:50 Willamette 110 | Office Hours: Th 10:00-12:00  

| Textbook | Conceptual Physics 9e, by Paul Hewitt (required) | Willamette 217  

| Final | June 8th, 15:15-17:15 Willamette 110 | mfairban@darkwing.uoregon.edu  

|  | Office Hours: Tu 10:00 - 11:00 | Science Library.  

Overview  

Physics is nothing less than the study of the universe around us. With an aggressively reductionist viewpoint, physicists work to develop a few (or one) compact and universally portable rules which describe all observable processes in nature. 

The success of physics as a discipline (and science in general) is largely due to the continuing evolution of physical knowledge gained through the scientific method. Physicists attempt to improve our understanding of how the universe works by systematically observing phenomena and identifying relationships in the observable quantities. Once the important observables and their relationships are identified, theories can be constructed to try to explain what has been observed and to predict other phenomena. These theories can then be tested directly with experiments, and
either be verified or found lacking.

Typically, the advance of physics is characterized by new theories which modify and expand older theories, rather than completely discredit them. Phenomena observed centuries ago are still the same today. If you drop an apple it will fall to the ground, just as it did for Newton. The theory of gravity developed by Newton is still valid today, although some modifications are necessary to deal with more extreme environments, like near a black hole. This constant building of knowledge upon the foundation of the work of previous scientists is a continual process. No theory is ever "proven" to be true, and the answer for how the universe behaves will never fully be answered.

In this course, you will be introduced to a range of interesting physical phenomena which relate to everyday living. Rather than merely read about concepts in a book, however, we will observe the phenomena in question and see how the theories which describe these phenomena were developed. Physics is an ongoing process which anybody can participate in, and the best way to understand your world is to go out and test it.

**Learning Goals**

The goal of this class is to develop a more fundamental understanding of the nature of scientific inquiry, and foster a conceptual understanding of the following physics principles:

- Nature of Temperature and Heat
- Waves and Sound
- Electricity and Magnetism
- Nature of Light

**Syllabus**

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<thead>
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<th>Week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Friday</th>
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<tr>
<td>3/29 - 4/2</td>
<td>Introduction</td>
<td>Energy/Matter (Minilab 1)</td>
<td>Temp and Heat</td>
<td>Heat Transfer</td>
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<td>4/5 - 4/9</td>
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<td>ILD1 Minilab 1 due</td>
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<tr>
<td>4/12 - 4/16</td>
<td>Waves</td>
<td>(Concept Check)</td>
<td>Phase Change</td>
<td>ILD2</td>
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<tr>
<td>4/19 - 4/23</td>
<td>Music</td>
<td>(Review)</td>
<td>HW1 due</td>
<td>Exam Recap</td>
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<tr>
<td>4/26 - 4/30</td>
<td>Electrostatics</td>
<td>(Minilab 2)</td>
<td>HW2 due</td>
<td>Electrostatics</td>
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<td>Midterm Exam #1</td>
<td>ILD3 Minilab 2 due</td>
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<td>HW3 due</td>
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<td>5/3 - 5/7</td>
<td>Magnetism (Concept Check)</td>
<td>Magnetism HW4 due</td>
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<td>5/10 - 5/14</td>
<td>Induction (Review)</td>
<td>Midterm Exam #2 HW5 due</td>
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<td>5/17 - 5/21</td>
<td>Light/Color (RWP Report Concept Check)</td>
<td>Light Waves HW7 due</td>
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<td>5/24 - 5/28</td>
<td>Refraction (Minilab 3)</td>
<td>Particle Physics HW8 due</td>
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<td>10</td>
<td>5/31 - 6/4</td>
<td>Memorial Day Light Emission RWP Report due</td>
<td>Course Review</td>
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<td>6/7 - 6/11</td>
<td>Final Exam 15:15-17:15</td>
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Note: Syllabus subject to change, please check the Web for latest version.

**Course Requirements**

**Course Work**

- Weekly homework assignments
- Interactive Lecture Demonstrations
- Take home MiniLabs
- Real World Physics report

**Exams**

There will be two midterm exams and one comprehensive final. These will focus on testing your understanding of physics concepts.

**Grading Summary**

- 30% Homework
- 10% ILDs
- 15% MiniLabs
- 10% RWP report
- 35% Exams (10% each midterm, 15% final)

**Grade Reports**
Up to date grade reports for this class can be found on the Blackboard website. Please check this occasionally to make sure there isn't any discrepancy with the work you have done. Also, your blackboard email will be used for course announcements. Please make sure this goes somewhere that you check regularly.

**Homework**

Weekly homework assignments will be given from the *Exercises* (not *Review Questions*) in Hewitt. These are due by the **start of lecture** Wednesday since we may go over some of the homework problems during class. Homework can be turned in either at the start of class or directly to my mailbox in the Physics office. Homework turned in late will be graded and returned, but **no credit will be given**. Please do not be late. Homework assignments will be announced in class and posted on the web here.

**Interactive Lecture Demonstrations**

ILDs give you the opportunity to test your conceptual understanding of physics using simple demonstrations of real-world phenomena. The key feature of the ILD is that each student is asked to predict the outcome of an experiment in advance. ILD handout materials are designed to provoke students to grapple with their understanding of physics concepts, and completed ILD sheets will be collected at the end of the ILD session. These ILD sheets are graded strictly for participation, not content, and they will not be returned to the student.

A typical ILD will ask the student to sketch the velocity of a baseball as it is thrown in the air. The students will be asked to discuss the predictions amongst themselves, and then the demonstration will be performed. Afterwards, the students are asked to record what really happened and interpret these results in terms of fundamental physics concepts.

ILDs will be presented on Fridays. The ILD sheets will be provided for you at the start of the session. Copies can also be found on the web here.

**MiniLab Modules**

Any study of Physics should involve hands-on tests of the fundamental principles. Reading a concept in a book is not nearly as rewarding as actually observing this concept in real life. Most of the physics we will study in this class was originally observed centuries ago with much cruder equipment than we have readily available today.

Short take-home lab assignments will be available in class and on the web here. These handouts will give step-by-step directions for collecting data, as well as how to analyze the data and interpret the results. Completed lab result sheets are due by lecture on Friday. You may either do these labs individually or in small groups (no more than five people please).
The equipment needed for these labs will be minimal, and kits will be available for checkout from the Physics demo room (Willamette 109) starting on Monday before a lab is due. You may also feel free to put together the equipment yourself. Using exactly the same equipment as the provided kit is by no means required. The important point is to test and understand the concepts, not simply follow some recipe.

For those students who are not quite so comfortable with getting their hands dirty, the Tuesday session during a lab week will be devoted to a short demonstration of the lab assignment. The instructor and/or TA will also be available to help groups working in the Willamette atrium area on Tuesday until 4 PM.

These Tuesday class sessions during lab weeks are strictly optional. Feel free to do your labs on your own whenever you have time. Since we only have about five equipment kits, do not expect to be able to do this on Friday morning.

**Real World Physics Report**

Believe it or not, physics is happening around you all of the time. The simple act of stirring your coffee, for example, illustrates many physics principles including heat capacity, evaporation, light refraction, and so on.

To complete your RWP report, you should watch for everyday examples of the physics concepts we are covering in class. Your report should be no more than two pages, and include either a photograph or a sketch of the phenomenon in question. Either should be annotated so that the important features are noted and labelled. The purpose of the report is to demonstrate a real-world 'application' of physics and demonstrate your understanding of these concepts beyond the problems given in the textbook. The relevant physics concepts (stated in words or as a formula) should be included and interpreted in the context of the phenomenon under consideration.

An example RWP report will be presented in class and posted on the web later in the quarter. RWP reports are due by 5PM on Tuesday June 1st (just after Memorial Day). Feel free to turn these in earlier.

**Student Resources**

The textbook should be your primary resource outside of lecture.

Both the teaching assistant and the instructor of this class have posted office hours which can be found at the top of this page.

Addison Wesley publishing also provides a companion web site for the textbook which you may find useful. The address is [www.physicsplace.com](http://www.physicsplace.com), and you should have free access from your
textbook. I don't know whether this works if you bought your book used, although 'trial' memberships are available. You may be able to find other sources of information on the web, but please be a bit cautious. Just because it is on the web does not make it true.

Students seeking more intensive and personal help may be interested in hiring a physics tutor. The physics office has a list of grad students who are available for tutoring.