Physics try to understand the world around them by observing natural phenomena…an apple falling from a tree for example. They try to uncover the important and unimportant variables controlling these phenomena (the apple’s size?, density?), and build hypothetical models—often in the form of simple mathematical relationships—that not only accurately describe what they observed but, also, predict the outcome of future experiments. These hypothetical relationships are improved through a process whereby models are tested in many different situations and refined until they are generally applicable everywhere. The set of models comprising physics was built up over a long time by many brilliant individuals, but you shouldn’t just take their word for it!

The RealTime Physics laboratory is designed to be a place for active learning. You will be constructing your working knowledge of the physical world around you from laboratory observations. Your goal is to learn as much as you can from your observations, rather than ensure that your findings agree with what you already knew before coming to lab!

Time in lab is spent predicting experiment outcomes, analyzing the graphs and discussing the results, which are acquired and displayed with the aid of Macintosh computers and various probes. During the first five labs of winter term we will concentrate on understanding temperature and its relationship to heat energy transfer and work; mechanisms for heat energy transfer; the First Law of Thermodynamics; the Ideal Gas Law; the molecular model for pressure from a gas; and heat engines. The paradigm of heat engines, for example, is applicable to a wide range of every-day phenomenon, including internal combustion engines and weather systems. This study of heat and thermodynamics culminates in a term project where you investigate heat flow in a house or the relationships between pressure, volume and temperature. For the final three labs of term, we will explore the physics behind simple optical systems—your eyeglasses or sunglasses for example. In particular, we will develop rules governing geometric optics, the bending and focusing of light rays by lenses and mirrors.

over-
INTRO PHYSICS LAB - PHYS 205: COURSE INFORMATION

Pre/Co-requisite: PHYS 202 or 252

Head Instructor: Dr. Dean Livelybrooks  Office: 225 Willamette  Phone: 346-5855 dlivelyb@hendrix2.uoregon.edu

Course Workbook: RealTime Physics Module 2: Heat & Thermodynamics, by Sokoloff, et al. (Available at the UO Bookstore, please purchase before term begins.)

Preparation for Lab: A pre-lab exercise sheet, included with your lab workbook, is due each week at the start of your lab. This sheet will help you organize your understanding of the goals and procedures for the lab. Failure to turn in a pre-lab exercise sheet results in a five-point deduction from your grade.

Work in the Lab: Plan to stay in the lab until you can show your instructor the completed lab sheets with all questions answered completely. It is to your advantage to complete your lab write-up during or just after your lab section, when what transpired is still fresh in your mind.

Lab Homework: Completed lab sheets and homeworks are due the following Friday by 5:00PM. You will lose 6 points out of 35 if they are turned in by 5:00PM the following Monday, and 3 points for each day late after that. Turn in your completed lab sheets and homework in your instructor's box outside room 15 Willamette.

Grading: Grades will be based on lab sheets, homework, the term project, and the laboratory final. You must attend and complete seven labs, or you will receive a failing grade for the course. The relative weights are:

- Lab sheets (20 points each) 140 points (38%)
- Homeworks (15 points each) 105 points (28%)
- Term Project 60 points (16%)
- Laboratory final 60 points (16%)
- Performance points (assigned by TA) 5 points (1%)
- Total possible 370 points

The grade distribution will be as follows: 333-370 => A- -> A+, 296-332 => B- -> B+, 259 - 295 => C- -> C+, 222-258 => D -> D+, below 222 = F.

Final Exam: A term project involving heat & thermodynamics in the real world will be undertaken during the week of February 16th (see next page). A written final exam for all sections will also be given on Weds., March 17 at 6pm (see Laboratory Schedule below).

Lab Completion Policy: To receive a passing grade in the course, you must complete all but one lab. If you complete all 8 labs, the 7 best (total) lab scores will be used to calculate your grade. Regardless, you will be responsible for understanding all course material. If you miss two or more labs, you will fail the course, unless you present an extraordinary reason to the head instructor in advance of the final week of term. You are also required to complete the term project and take the final exam in order to pass the course.
### PHYS 205 Instructional Staff:

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Email</th>
<th>Office</th>
<th>Phone</th>
</tr>
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<tbody>
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</tr>
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### IPL SCHEDULE — Winter, 2004

<table>
<thead>
<tr>
<th>Week</th>
<th>Lab</th>
<th>Title - (Notes)</th>
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<tbody>
<tr>
<td>January 5</td>
<td>Lab 1:</td>
<td>Heat as Energy Transfer &amp; Temperature (PL2/HW2)</td>
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<tr>
<td></td>
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<td>Lab 2/Inv. 1: Heat Transfer as Energy Transfer</td>
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<td>Lab 2/Inv. 2: Relationship between Heat Energy and Temperature</td>
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<td>Lab 2/Inv. 3: The Mechanical Equivalent of Heat</td>
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<tr>
<td>January 12</td>
<td>Lab 2:</td>
<td>Mechanisms for Heat Energy Transfer (PL3/HW3)</td>
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<td>Lab 3/Inv. 1: Heat Energy Transfer and Temp. Difference</td>
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<td>Lab 3/Inv. 2: Controlling the Transfer of Heat Energy</td>
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<td>Lab 3/Extension 2-4: Which Feels Cooler (all)</td>
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<tr>
<td>January 19</td>
<td>no labs</td>
<td>Lab 3/Inv. 3: Heat Transfer by Radiation</td>
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<tr>
<td>January 26</td>
<td>Lab 3:</td>
<td>MLK holiday on Monday, no labs held all week</td>
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<tr>
<td>February 2</td>
<td>Lab 4:</td>
<td>1st Law of Thermodynamics and the Ideal Gas Law (PL4/HW4)</td>
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<tr>
<td>February 9</td>
<td>Lab 5:</td>
<td>Lab 4/Inv. 1: Heat Energy Transfer w/o Temp. Change</td>
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<td>Lab 4/Inv. 2: Change of Phase from Liquid to Gas</td>
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<td>Lab 4/Inv. 3: Work Done by a Gas, Heat Transfer.... and the First Law of Thermodynamics</td>
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<td>February 16</td>
<td>Term Project</td>
<td>The Ideal Gas Law (PL5/HW5)</td>
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<td>The Molecular Model (Web-based activity)</td>
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<td>Lab 5/Inv. 2: Behavior of a Gas in Terms of P, V &amp; T</td>
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<td>February 23</td>
<td>Lab 6:</td>
<td>Heat Engines (PL6/HW6)</td>
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<td>Lab 6/Inv. 1: Heat Engines and Cycles</td>
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<td>Lab 6/Inv. 2: Work done during PV Cycles</td>
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<td>Lab 6/Inv. 3: The Incredible Mass-Lifting Heat Engine</td>
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<tr>
<td>March 1</td>
<td>Lab 7:</td>
<td>These will be handed out the week of Feb. 9. There are 2 to choose from: 1) conservation in the home; 2) a case of bike psych.</td>
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<td>March 8</td>
<td>Lab 8:</td>
<td>Introduction to Light</td>
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<td>(Pre-lab, lab to be handed out during lab 5, HW handed out in lab)</td>
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<td>March 17</td>
<td>Final Exam-all sections</td>
<td>Reflection and Refraction (as in Lab 6)</td>
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<td>Geometrical Optics—Lenses (as in Lab 6)</td>
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<td>6:00-8:00 PM (18:00-20:00) — room 100 Willamette</td>
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