Foundations of Physics

**PHYS 251 - Fall 2012**

[http://physics.uoregon.edu/~torrence/251/](http://physics.uoregon.edu/~torrence/251/)

Updated Tuesday October 30, 2012

Home | Syllabus | Homework | Exams | Tutorials | Blackboard

**Homework #4**, due October 31st

**First Midterm Results**

**Homework #5**, due November 7th

| Instructor      | Prof. Eric Torrence | Willamette 418, 346-4618  
torrence (at) uoregon (dot) edu  
Office Hours:  
Friday 2-4  
or by appointment |
|-----------------|---------------------|-------------------------------------------------|
| Teaching Assistants | Jeremy Copperman  
  jcopperm (at) uoregon (dot) edu  
  Office: Tu 1-2, Kal. 135  
  Help Center: Tu 2-3, Will. 147 |
|                 | Dileep Reddy  
  dileep (at) uoregon (dot) edu  
  Office: F 10-11, Will. 215  
  Help Center: Tu 3-4, Will. 147 |
|                 | Christopher Jackson  
  cjackson (at) uoregon (dot) edu  
  Office: M 3-4, Will. 218  
  Help Center: Tu 9-10, Will. 147 |
| Help Center Hours | Homework help will be available at these times. Specific GTFs times are posted above.  
Su 1-4 in Onyx B90CD (Sci. Lib.)  
M 12-3 in Will. 147  
Tu 9-4 in Will. 147 |
| Lecture         | MWF 11:00-11:50 Willamette 100 |
| Tutorials       | All tutorials are Thursday in Willamette 13 |
**Labs**
PHYS 290 recommended, but not required

**Textbook**
*Physics for Scientists & Engineers with Modern Physics, 4/E*, Giancoli
Two copies will be on reserve in the Science Library

**Pre/Co-req**
Math 251 or equivalent

**Overview**

Fall term will be concerned primarily with classical (Newtonian) mechanics, the basis for all modern physics. The following topics (Ch. 1-12) will be covered:

- Kinematic motion in 1D and 2D
- Newton's Laws
- Conservation of Momentum
- Conservation of Energy
- Rotational Motion

Physics is intrinsically a "simple" subject in the sense that natural phenomena are explained by reducing them down to a few underlying principles. There are two important goals for this course:

- Learning the fundamental concepts underlying mechanics. There are really only a few main concepts which mechanics, and hence the motion of objects in the physical universe, is built upon.
- Physics is inherently quantitative. Learning how to arrive at quantitative answers is an important part of physics, and the homework assignments are the primary tool to master this skill.

**Syllabus**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Assignment</th>
<th>Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Ch. 1: Units, dimensions</td>
<td>Ch. 2: 6, 12, 23, 24, 27, 38, 48, 52, 54, 55, 76, 92</td>
<td>Significant Figures and Problem Setup</td>
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<tr>
<td>9/24-9/28</td>
<td>Ch. 2: Kinematics in 1D</td>
<td>Do the HW Problems not the Questions</td>
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<tr>
<td>Week 2</td>
<td>Ch. 3: Kinematics in 2D, Vectors</td>
<td>Ch. 3: 9, 12, 17, 22, 32, 52, 87, 88, 90, 95</td>
<td>2D Motion</td>
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<td>10/1-10/5</td>
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<tr>
<td>Week 3</td>
<td>Ch. 4: Newton's Laws</td>
<td>Ch. 4: 8, 13, 18, 33, 40, 48, 58, 68, 76, 85</td>
<td>Free Body Diagrams</td>
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<td>10/8-10/12</td>
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<tr>
<td>Week</td>
<td>Ch. 5: Friction</td>
<td>Ch. 6: Gravitation</td>
<td>Ch. 5: 8, 11, 16, 34, 44, 51, 88, 95, 10/19</td>
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<td>Week 4</td>
<td>No homework assigned</td>
<td>10/19</td>
<td>Ch. 6: 9, 30</td>
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<td>10/15-10/19</td>
<td>First Midterm, Friday</td>
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<td>Week 5</td>
<td>Ch. 5: Friction/Circular Motion</td>
<td>Ch. 7: 12, 25, 31, 38, 57, 66, 84, 10/19</td>
<td>Work</td>
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<tr>
<td>10/22-10/26</td>
<td>Ch. 6: Gravitation</td>
<td>Ch. 8: 14, 19, 20</td>
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<td>Week 6</td>
<td>Ch. 7: Work and Energy</td>
<td>Ch. 7: 12, 14, 19, 20</td>
<td>Work</td>
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<tr>
<td>10/29-11/2</td>
<td>Ch. 8: Conservation of Energy</td>
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<tr>
<td>Week 7</td>
<td>Ch. 8: Conservation of Energy</td>
<td></td>
<td>Energy</td>
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<tr>
<td>11/5-11/9</td>
<td>Ch. 9: Momentum</td>
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<tr>
<td>Week 8</td>
<td>Ch. 9: Momentum</td>
<td>No homework assigned</td>
<td>Midterm Review (not mandatory)</td>
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<td>11/12-11/16</td>
<td>Second Midterm, Friday 11/16</td>
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<td>Week 9</td>
<td>Ch. 10: Torque</td>
<td>No Class Nov. 23</td>
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<td>11/19-11/23</td>
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<td>Week 10</td>
<td>Ch. 10: Rotational Motion</td>
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<td>Rotational Energy</td>
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<td>11/26-11/30</td>
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<td>Finals</td>
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<td>Final Exam Wednesday Dec. 5th, 10:15-12:15</td>
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<td>12/3-12/7</td>
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This syllabus is tentative, and is subject to change as the quarter progresses.

Students need to be co-enrolled in Calculus (Math 251), or to have taken an equivalent course previously. Many students, however, have much more trouble with trigonometry and vectors than with calculus. We will try to review a bit of the necessary math background here, but if you know you are weak on vectors you may want to read through the first few sections of chapter 3 before we get to this in class.

**Grading**

Course grades will be based on weekly homework assignments (30%), tutorial participation (10%), two midterm exams (15% each), and a final exam (30%).

**Homework**
Remember to do the *Problems* not the Questions. Solutions will be posted to Blackboard the evening after the assignment is due. Note that the numerical answers to the odd-numbered problems are in the back of your book. *You must show your work to get credit for a problem!*

- Homework #1 (Due Oct. 3rd) - Chapter 2, Problems: 6, 12, 23, 24, 27, 38, 48, 52, 54, 55, 76, 92
- Homework #2 (Due Oct. 10th) - Chapter 3, Problems: 9, 12, 17, 22, 32, 52, 87, 88, 90, 95
- Homework #3 (Due Oct. 17th) - Chapter 4, Problems: 8, 13, 18, 33, 40, 48, 58, 68, 76, 85
- Homework #4 (Due Oct. 31st) - Chapter 5, Problems: 8, 11, 16, 34, 44, 51, 88, 95, Chapter 6, Problems: 9, 30
- Homework #5 (Due Nov. 7th) - Chapter 7, Problems: 12, 25, 31, 38, 57, 66, 84, Chapter 8, Problems: 14, 19, 20

One of the key goals of this course is to become proficient in solving physics problems. Homework problems are your primary tool for practicing this skill. Homework will be assigned from the text and will be due as posted above. Typically, assignments will be posted on Wednesday and due on the following Wednesday at the start of class (11 AM). To receive full credit you must *show your work*!

Homework should be turned in before class starts in Willamette 100, although you may turn it in early if you wish. Graded assignments will be returned in class on the following Monday. You may either turn in the homework to the cardboard boxes in class, or in the wooden box in the basement.

I will post homework solutions Wednesday evening after the assignments are due. Late homework will be accepted up until 5PM on Wednesday with a 25% penalty. Turning in your homework after 5PM on Wednesday is possible, but 50% of the assignment value will be deducted right off the top. If your answers are clearly copied from the solutions, no credit will be given. Turning in late homework is better than nothing, and practicing the problems will undoubtedly help you on the exams, but staying on top of the assignments and getting your work done on time is a key to achieving a good grade in this course.

If you turn in all of your homework assignments *on time and completed*, I will drop your single worst homework score when I determine your homework percentage grade. If you simply don't turn in one of your homework assignments, or don't make a valid attempt at solving the majority of the problems, you will not receive this benefit. Turning in a blank page with your name on it does not count as having done your homework. Points deducted for being late are also not eligible for being dropped.

Due to the size of this class, we may not grade every single homework problem in detail, and the graders will likely not make extensive corrections to your work on your homework assignment. It is your responsibility to go over your graded homework assignment and compare your answers with the posted solutions. Grades will be posted to Blackboard as soon as they
are ready. Please check your Blackboard account regularly and report any discrepancies or possible errors as soon as you notice them.

You are encouraged to find help in doing your homework, including from other students, your TAs, the physics department drop-in help center, and the instructor during office hours. Discussing homework with other students is a very good way to discover conceptual difficulties and can be a powerful tool for improving your understanding of the subject. To facilitate students who wish to work together, we will have scheduled times in the physics drop-in center (Willamette 147) when your TAs and instructor will be present to help people with homework issues. The physics reading room in the atrium of Willamette hall is also available for students wishing to work together. There will also be a Sunday afternoon session in Onyx B90CD, which is one of the rooms off the Science Library.

For students looking for more intensive help, or looking for more one-on-one time, there is a list of tutors available for hire in the physics office. These are typically current UO physics graduate students or advanced undergraduates, and the list is made available by the department strictly as a helpful service (to both parties). All arrangements must be made directly with the tutors.

Exams

There will be two in-class midterm exams and one final exam. These are the primary tools for assessing whether you have achieved the course goals. Exam problems will be similar to homework problems, in that you must solve quantitative problems on the physics topics addressed. All exams will be closed book, although you may bring one handwritten, single-sided, notebook-sized sheet of notes if you wish. Calculators may be used, although no stored equations or electronic dictionaries are permitted. Scientific calculators will be provided on request.

The exams will very likely be held on the dates indicated on the syllabus above, but I reserve the right to move these in case some real tragedy strikes. The exact exam dates will be announced at least a week before the exam. Practice exams and solutions will be provided in the week before each midterm. If you have a worse score on one of your midterms than on the final, that midterm score can be dropped and replaced with the final exam score. This gives you a chance to redeem yourself if you really screw up a midterm.

Tutorials

Each of you should be enrolled in one of the five tutorial sessions on Thursday. Attendance at these sessions is mandatory, aside from the exam review weeks which are optional. The tutorial sessions are designed to give students a chance to discuss and assess their understanding of the topics covered in class in a more interactive, group setting with direct feedback from the teaching staff. Students will work in groups on worksheets targeted towards the subject of the week, and must justify their answers at regular intervals to the TAs in the room. These sessions have been shown to be a particularly effective way for students to improve their understanding of the subject, and should be viewed as in integral part of the course instruction. We will also at
times introduce material in the tutorials, or go into more depth on material presented in lecture. Even if you miss a tutorial, you are responsible for the material covered there. Solved tutorial worksheets will be posted to Blackboard by the end of each Thursday.

The tutorials will be graded for attendance and reasonable participation only. Your worksheet answers will not be graded for correctness, nor will the worksheets be collected at the end of the session. There will be signup sheets for taking attendance, but it is your responsibility to make sure that you attendance is noted before you leave. If you are really struggling with a particular topic, you should try to use your tutorial time working with the TAs to improve your understanding. Attendance at the tutorials is mandatory. You may skip one of the mandatory tutorials each quarter without penalty, but each additional tutorial missed will cost you 2% of your total grade, up to 10% in total.