PHYS 251H (CRN 15146): Foundations of Physics I, Fall 2005

Syllabus

Instructor
Heiner Linke
Phone 346 4503
Email linke@uoregon.edu
Office 373A Willamette
Office hours M 2 - 3
F 11 - 12

with the help of:
Benjamin Lopez (homework grading, office hours, and homework help)
Phone 346 4822
Email bilopez1@uoregon.edu
Office 374 Willamette
Office hours U 11 - 12, W 2 - 3, H 10 - 11.

Course Description
Phys 251 is the first part of the two-year series PHYS 251-2-3, 351-2-3, designed to provide an overview over the common principles of classical and modern physics.

The honors section PHYS 251H requires preparation in calculus. This section is designed to offer you a diversified set of assignment options that can be tailored to individual learning styles, and to encourage you to assume responsibility for your learning.

Objectives
- To learn fundamental concepts of classical physics.
- To develop qualitative thinking skills and problem solving skills that can be applied in a variety of fields.
- To develop learning skills.

Content
- Newton’s Laws: how to describe and predict translational and rotational motion.
- Concepts of force, momentum, and mechanical energy.

Pre-requisites
Calculus: MATH 252 or equivalent. In order to enroll, please contact the instructor (see above) or the physics undergraduate advisor (Prof. Dean Livelybrooks, WIL 225, dlivelyb@hendrix.uoregon.edu) for authorization.

Textbook
The official textbook for PHYS 251H-2H-3H as well as for PHYS 251-2-3 is Giancoli: Physics for Scientists and Engineers, Third Edition (Prentice Hall). This book will be used in both sections throughout the year.

An alternative book for the Honors section during Fall term is Resnick, Halliday and Krane, PHYSICS, Volume I, 5th Edition (2002), Wiley. This book is a little more thorough than Giancoli. In addition, I personally find the two volumes (Volume I and II) to be the better reference general physics book for longterm use. In Fall term 2005 you may use either Resnick or Giancoli. However, in Winter and Spring you may need to own Giancoli.
Additional/alternative reading (optional)

"Understanding Physics" by Cummings (Wiley) is strongly based on Resnick/Halliday/Krane, with lots of additional, interesting examples. You can use this book instead of Resnick.

Serwer and Jewett: "Physics for Scientists and Engineers" (Thomson).

"The Feynman Lectures on Physics" (Addison Wesley) are a classic that looks at much of the material from an entirely different point of view. It makes for great additional reading for the seriously intrigued. Its possible to read individual chapters.

More fun than textbooks

"Introducing Newton" by William Rankin (Totem Books) is of the cartoon type and a great introduction to Newton's Laws and their historical context. You can read it anytime, and its fun (actually!).

The following two books are entertaining collections of high-quality, "everyday" type physics problems:

"Mad about physics" by C.P. Jargodzki and F. Potter (Wiley & Sons)

"The flying circus of physics" by J. Walker (Wiley & Sons) has lots of good literature references.

Mathematical tables

In PHYS 251 you most likely will not need any mathematical equations that are not listed in the textbook (check out the textbook's appendices). However, in the future, as you continue your studies in physics, you will find it increasingly useful to be able to look up integrals, basic mathematical rules, etc. If you want to acquire such a reference already now, many students use the following:

"Mathematical Handbook of Formulas and Tables" by Spiegel and Liu, Schaum's Outlines Series

Course format

Mondays, Wednesdays and Fridays (10 - 10:50, WIL 110) will be used to push ahead with course content. You are expected to read the textbook before coming to class (see below for details on reading assignments and reading quizzes). All material assigned in the textbook is required course content, whether we discuss it in class or not. Tuesday sessions (10 - 10:50, WIL 110) will be used for a variety of learning activities including the discussion of assignments, group work, problem-solving sessions, and possibly a research lecture.

Grading

Reading quizzes, Homework, Midterm, and Extra Assignments together 60% or more
Final exam 40% or less

Reading quizzes, Homework, Midterm and other assignments together are worth nominally 60%. Points earned in any and all of these activities count towards the total. You need 600 points to achieve the full 60% in this category, but through extra credit you can earn substantially more than that.

If you earn less than 600 points, say 480, then the best possible final grade you can achieve (assuming a perfect score in the final exam) will be 48% + 40% = 88%.

However, if you earn more than 600 points, say 680, then you have a perfect score on 68% of the course, and the value of the final exam will be reduced from 40% to [40 - (68-60)]% = 32%. If you get 80% on the final exam, your grade will be (0.68*100% + 0.32*80%) = 94%.

Available points (approximate numbers, subject to small changes)

Reading quizzes (20 - 25 quizzes, 3 -7 points per quiz)
Core homework (9 weekly assignments for 30 - 40 points each)
Midterm 1
Midterm 2
Extra homework problems (ca. 10 - 20 points per weekly assignment)
Learning Logs
Extra Assignments, Bonus Points
TOTAL POSSIBLE

ca. 120
ca. 340
ca. 80
ca. 80
ca. 150
ca. 80
up to ca. 75
a lot more than 600
Grading scheme (I will possibly be more generous, but will not grade harder than shown.)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>97% or more</td>
<td>A+</td>
</tr>
<tr>
<td>93 - 96%</td>
<td>A</td>
</tr>
<tr>
<td>90 - 92%</td>
<td>A-</td>
</tr>
<tr>
<td>87 - 89%</td>
<td>B+</td>
</tr>
<tr>
<td>83 - 86%</td>
<td>B</td>
</tr>
<tr>
<td>80 - 82%</td>
<td>B-</td>
</tr>
<tr>
<td>75 - 79%</td>
<td>C+</td>
</tr>
<tr>
<td>65 - 74%</td>
<td>C</td>
</tr>
<tr>
<td>60 - 64%</td>
<td>C-</td>
</tr>
<tr>
<td>50 - 59%</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 50%</td>
<td>Fail</td>
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</tbody>
</table>

How do I decide which assignments to complete?

The grading scheme is designed to give you freedom in managing your time, and to allow you to engage in those learning activities that you find most effective.

Early in the term you may feel uncertain what activities to prioritize. In this case I recommend to focus on the "core assignments": reading quizzes, core homework and the midterms. Together, these activities allow you to achieve a perfect grade.

As you become more confident, you should make up your own, customized plan, emphasizing activities that you find more useful than others. For instance, if you find reading quizzes useless (actually most students end up finding them quite useful) you may decide to do an extra project and regularly do some extra homework instead.

Reading assignments and reading quizzes

Reading assignments will be announced on Blackboard in the Assignment Folder. You are expected to work through the reading before coming to class, and to review your notes and the text after class. For each assignment, a short on-line quiz will be available on Blackboard for about two days until shortly before class begins (until 9:45 am).

NOTE: In rare cases a browser problem may prevent you from submitting your quiz. To be sure that your score was counted, please wait for the confirmation after submission. You can also confirm your grade online using Blackboard. If there is any problem, please send me an email immediately (linke@uoregon.edu) and check your email before coming to class. Usually I can clear your attempt online, and you can retake the quiz without problems, before class.

Homework

Homework problems will be assigned weekly on Fridays, either on Blackboard or through a handout in class. Each homework will contain a number of "core problems" which will add up to approximately 340 points over the course of the term, plus "extra problems" for additional points. The only reason for distinguishing "core" and "extra" points is to give you a guideline for how much homework you should do if you prefer to follow a more traditional grading scheme (see "How do I decide which assignments to complete?").

• Homework is due in the week after it was assigned, tentatively on Fridays at 4 pm.
• Please submit your homework in class or into the box outside WIL373.
• You are strongly encouraged to collaborate on homework, and to seek help from the instructor or TA (every day of the week, one of us has office hours), but each student must submit her own work.
• Outside office hours, rather than emailing questions, please post questions on the Discussion Board on Blackboard. Please feel free to answer your peer's questions (the instructor will also do so).
• Solutions will be posted on Blackboard, and graded homework will be returned in class, usually on Wednesdays.
• Late homework must be submitted in person to the TA (Ben Lopez), or in his mailbox inside the "Binney Lounge", WIL 215. Late homework will automatically lose 20% of the points unless very compelling reasons are stated to the instructor (Heiner Linke) BEFORE the deadline. Extra homework problems cannot be submitted late. Problems submitted after solutions are posted will not be graded.

Extra Assignments
You can earn extra points through activities that engage you in thinking about the course material. During the course of the quarter I will suggest a few such assignments. You may also propose assignments yourself, such as:
• a written report on a topic of your choice (an experiment you carry out, a computer simulation, a special topic report, a reading report, ...).
• an oral presentation of a special topic of your choice in one of the Thursday sessions.
• an extra problem worked out in extra detail.
If you think you may want to do an extra assignment, start thinking about it early and be sure to stay in close contact with me, and discuss the topic with me. I require that the assignment stands in direct relation to course material. You must work with me to set your own, firm deadlines, and submit early versions of your work for feedback. The point score will take into account improvement on early versions, and the quality of the presentation (clarity, form, grammatical correctness, etc.).
Expectations for extra assignments are high. There must not be the shadow of a doubt that you deserve at least 50% of the points for a specific assignment, or it will not be counted towards your grade. If in doubt about expectations, be sure to communicate with the instructor.

Bonus points
Small amounts of bonus points will be made available at the discretion of the instructor.

Learning log
One of the course objectives is to make you aware of and improve your learning skills. To assist in this process, optional "Learning Log" assignments will be announced in the Learning Log folder inside the Assignment folder on Blackboard.
NOTE: I expect thoughtful work. For a particular Learning Log assignment to count towards your grade, you must earn at least 50% of the possible points for that assignment.

Tests and exams
Midterm and Final will use a mixture of multiple choice questions, conceptual "short answer" questions, and problems similar to homework problems:
Midterm 1: Tuesday, Oct. 18, 10:00 - 10:50 (WIL 110): Chapters 1-5
Midterm 2: Tuesday, Nov. 6, 10:00 - 10:50 (WIL 110): Chapters 1-9
Final: Monday, December 5th, 10:15 - 12:15, WIL 110; Chapters 1-12
No make-up exams will be given. In case of an unavoidable absence from one of the midterms, contact the instructor prior to the exam.

Web resource
I will use Blackboard as the web resource. You should have received an email with information on how to log onto Blackboard (using your Gladstone username and password). For access and information, please go to: http://blackboard.uoregon.edu If you experience any problems, please visit the Knight or Science Library ITC for assistance.
Attendance policy
Attendance will not be checked or graded. If you miss class it is entirely your responsibility to obtain all information provided in class from another student. For those present in class, occasional in-class assignments can be used for bonus points.

Late submission policy
Deadlines for Reading Quizzes, Extra Assignments, Bonus Points, Extra Homework Problems and Learning Log entries are strict. For late homework, see Homework.

Optional Lab Course (recommended)
The lab course PHYS 290 (1 cr) is designed to complement the PHYS 251-2-3 course series. It is recommended to all 251H students. Physics majors should take it, and pre-meds may have to take it.

First meeting of PHYS 290: Thursday, September 29, 10 - 11 am, WIL 110.

Tentative course outline (see Blackboard for updates).

<table>
<thead>
<tr>
<th>Week</th>
<th>Material (Chapters)</th>
<th>Reading assignment (see Blackboard)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. 26 - 30</td>
<td>1 Intro &amp; Units</td>
<td>Wed 9/29: Handout on the weight standard, Ch 1 and Appendices A,B,C</td>
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<tr>
<td></td>
<td>2 Motion in 1D</td>
<td>Fri 10/1: Ch 2 and Appendix H</td>
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<tr>
<td>Oct. 3 - 7</td>
<td>3 Motion in 2D</td>
<td>Mon 10/4: Ch. 3:1-5</td>
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<td></td>
<td>4 Force, Newton's laws in 1D</td>
<td>Wed 10/6: Ch 3:6-8</td>
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<tr>
<td>Oct. 10 - 14</td>
<td>5 Applications of Newton's laws</td>
<td>Fri 10/8: Ch 4:1-4</td>
<td></td>
</tr>
<tr>
<td>Oct. 17 - 21</td>
<td>6 Gravitation</td>
<td>TBA</td>
<td>Midterm 1, Tue Oct 18</td>
</tr>
<tr>
<td>Oct 24 - 28</td>
<td>7 Work and Energy</td>
<td>TBA</td>
<td>WIL 110 (Ch. 1-5)</td>
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<tr>
<td>Oct. 31 - Nov. 4</td>
<td>8 Conservation of Energy</td>
<td>TBA</td>
<td></td>
</tr>
<tr>
<td>Nov. 7 - 11</td>
<td>9 Momentum and Collisions</td>
<td>TBA</td>
<td>Midterm 2, Tue Nov. 6</td>
</tr>
<tr>
<td>Nov. 14 - 18</td>
<td>10 Rotation about fixed axis</td>
<td>TBA</td>
<td>10.00 – 10:50 WIL 110 (Ch. 1 - 9)</td>
</tr>
<tr>
<td>Nov. 21 - 25</td>
<td>11 General rotation</td>
<td>TBA</td>
<td>Thanksgiving week</td>
</tr>
<tr>
<td>Nov. 28 – Dec. 2</td>
<td>12 Equilibrium</td>
<td>TRA</td>
<td>Final Wed Dec. 8, 10:15-12:15 WIL 110</td>
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</tbody>
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Preview
PHYS 252 will be a mixture of fairly independent topics: Special relativity, Fluids, Introduction to waves and oscillations, Introduction to topics of modern physics. (Halliday, Chapters 15-19, 20, 45 - 47, additional reading).