PHYS 251H (CRN 14118): Foundations of Physics I, Fall 2004

Syllabus

Instructor
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                           F 11 - 12

with the help of:
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Office hours U 1-2
                   W 2-3
                  H 1-2

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: 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.

Required textbook
You will need Volume II in Winter and Spring.

Additional/alternative reading (optional)
"Understanding Physics " by Cummings (Wiley) is strongly based on our book (Resnick/Halliay/Krane), with lots of additional, interesting examples. I like it quite a bit, but unfortunately it doesn't cover Modern Physics which we will need in Winter, and because it is new there are no used books around. Some of the homework problems will come from that book. If you want, you can probably use this book instead of Resnick.
Giancoli: "Physics for Scientists and Engineers" (Prentice Hall).
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, the following is used by many students:
"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. 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 a research lecture.

Grading
Reading quizzes, Homework, Midterm, and Extra Assignments
Final exam
together 60% or more
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, 4 - 6 points per quiz)
Core homework (9 weekly assignments for 30 - 40 points each)
Midterm
Extra homework problems (ca. 10 - 20 points per assignment)
Learning Logs
Extra Assignments, Bonus Points
TOTAL POSSIBLE

more than 100
ca. 340
160
ca. 150
ca. 80
up to ca. 100
a lot more than 600
Grading scheme (I will possibly be more generous, but will not grade harder than shown.)

<table>
<thead>
<tr>
<th>97% or more</th>
<th>93 - 96%</th>
<th>90 - 92%</th>
<th>87 - 89%</th>
<th>83 - 86%</th>
<th>80 - 82%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>A</td>
<td>A-</td>
<td>B+</td>
<td>B</td>
<td>B-</td>
</tr>
<tr>
<td>75 - 79%</td>
<td>65 - 74%</td>
<td>60 - 64%</td>
<td>50 - 59%</td>
<td>&lt; 50%</td>
<td>Fail</td>
</tr>
</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 midterm. Together, these activities allow you to achieve a perfect grade.

When you feel 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, and you will be fine anyway.

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 at least 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 immediately send me an email (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 350 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 usually due in the week after it was assigned, 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 (Andrew Cullen), 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.
• a very well-worked out extra problem.

If you think you may want to do 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 of 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 you are encouraged to keep a learning log for credit. Specific (optional) assignments for learning log entries will be announced in class and 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, Part 1: tentatively Tuesday, Oct. 19, 10:00 - 10:50 (WIL 110): Chapters 1-5
Midterm, Part 2: tentatively Tuesday, Oct. 26, 10:00 - 10:50 (WIL 110): Chapters 1-5
Final: Wednesday, December 8th, 10:15 - 12:15, WIL 110: Chapters 1-14

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 251 students. Physics majors should take it, and pre-meds may have to take it.

Tentative course outline (see Blackboard for updates).

<table>
<thead>
<tr>
<th>Week</th>
<th>Material</th>
<th>Reading assignment (see Blackboard)</th>
<th>Comments</th>
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| Sep 27 – Oct 1 | 1 Units  
2 Motion in 1D  
3 Begin Newton’s Laws | Wed 9/29: Handout on the weight standard,  
Ch 1 and Appendices A,B,C  
Fri 10/1: Ch 2 and Appendix H |                                |
| Oct. 4 - 8 | 3, 4 Force, Newton’s laws in 1D, 2D, 3D | Mon 10/4: Ch. 3:1-5  
Wed 10/6: Ch 3:6-8  
Fri 10/8: Ch 4:1-4 |                                |
| Oct. 11 - 15 | 5, 6 Applications of Newton’s laws, momentum | TBA |                                |
| Oct. 18 - 22 | 6, 7 Momentum, systems of particles | TBA | Midterm, Part 1, Tue Oct 19  
WIL110 (Ch. 1-5) |
| Oct 25 – 29 | 7, 8 Rotation Kinematics | TBA | Midterm, Part 2, Tue Oct 26  
10.00 – 10:50 WIL 110 |
| Nov. 1 - 5 | 9 Rotation Dynamics | TBA |                                |
| Nov. 8 – 12 | 10 Angular Momentum | TBA |                                |
| Nov. 15 - 19 | 11, 12 Work, kinetic and potential energy | TBA | Thanksgiving weak |
| Nov. 22 - 26 | 13 Conservation of energy (14 Gravity) | TBA | Final Wed Dec. 8, 10:15-12:15 WIL 110 |

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).

PHYS 253: Electricity and electromagnetism (Halliday, Chapters 25 - 38).

PHYS 351, 352, 353: Waves and oscillations, optics, interference, thermodynamics and heat engines.
Welcome to PHYS 251H, Fall 2004.

Class time: MUWF, 10:00 - 10:50, WIL 110
CRN: 14118
Link to the class schedule
Final exam: Wednesday, December 8th, 10:15 - 12:15, WIL 110.

About this class

PHYS 251 is offered in two sections:

The general section, PHYS 251 (CRN 14117, MUWF 9 - 9.50, WIL 110), will be taught by Prof. Frey.
The honors section, PHYS 251H (CRN 14118, MUWF 10 - 10.50, WIL 110), will be taught by myself (Heiner Linke).

The main differences between the two sections are:

- The honors section is smaller (no more than 30 students), allowing for a more interactive classroom.
- Introduction to calculus is a pre-requisite rather than a co-requisite, allowing us to spend less time on math and more on physics and the applications of calculus.
- Taking advantage of the small class size, I use a grading scheme that encourages individual work and allows you, to some degree, to decide which assignments you want to emphasize.

Apart from these differences, the material covered in the two sections is very similar:

The first term of PHYS 251-2-3 covers mechanics: Kinematics (how to describe motion) in one and two dimensions, Newton’s Laws (how to predict motion from the knowledge of forces), momentum, mechanical energy, and rotational kinematics and dynamics. Many of you will have dealt with these topics before in one way or another, but probably not using the tools of calculus. That’s what we will do.

PHYS 252 (Winter term) is an interesting mixture of several subjects: Special Relativity and Gravity; Fluids, Waves and Oscillations, and an introduction to ideas from Quantum Mechanics.
PHYS 253 (Spring term) is concerned with Electricl and Magnetism.

Prerequisites for PHYS 251H

MATH 251 and MATH 252 or equivalent are a pre-requisite.

Instructor permission is required to enroll in PHYS 251H.
For enrollment authorization, please contact the physics undergraduate advisor Prof. Dean Livelybrooks, office WIL 225, dlivelyb@hendrix.uoregon.edu.

Website

PHYS 251H will use Blackboard as the course internet resource. Once you have registered for the course, you will be able to log on using your gladstone username and password.

If you experience any problems, please visit the Knight or Science Library ITC for assistance.

Textbook

Please note that while you won't need Vol. II until about halfway through Winter term, it is cheaper to buy Vols. I and II at the same time.

**Bookhunt (U.O. Bookstore)**: Use the CRN 14118 to find book offers. They should be available from about September 15th.

**Used books**: Usually the bookstore offers you a choice of new books and used books.

It's also worth to check amazon.com and ebay.com for good deals on both new and used books.

In addition, there are other good books with different strengths around, and you will find it beneficial to read some chapters in more than one book. An example is *Physics for Scientists and Engineers* by Giancoli (Prentice Hall).

There is also "Understanding Physics" by Cummings (Wiley). That book is strongly based on our book (Halliday/Resnick/Krane), with lots of new and interesting examples. I like it quite a bit, but unfortunately it doesn't cover Modern Physics which we will need in Winter, and its so new that no used books are around.

"The Feynman Lectures on Physics" (Addison Wesley) are a classic and a great way to review the material looking from a different angle.

**Looking forward to seeing you in class on September 27th!**