

Physics 171 / 171H
Introductory Physics: Mechanics and Relativity
Fall 2008 — Professor Shawhan

Course topics:

Kinematics, Newton's laws, gravity, energy and work, linear momentum, special relativity, rotational kinematics, angular momentum, static equilibrium, elasticity, fluids, gases, and basic thermodynamics. This course is designed for physics majors and those desiring a rigorous preparation in the physical sciences. Knowledge of basic calculus will be assumed.

Prerequisites:

Math 140 (Calculus I) and a high school physics class, or permission of the department.

Lectures:

Mondays, Tuesdays, Thursdays, and Fridays from 9:00–9:50 in room 1201 of the Physics Building.

Note that Physics 171 and Physics 171H (the honors section) share the lectures. Students in 171H will also have a weekly discussion session at 3:00 on Fridays in room 1219.

Class attendance is important, and I expect you to come to class and to participate for your own benefit and enjoyment. I plan to make the class time fairly interactive, and we'll often talk about things which are not in the book. I do not attempt to keep records of class attendance.

Required textbook:

“Physics for Scientists & Engineers” by Douglas C. Giancoli, 4th edition, chapters 1-37, bundled with MasteringPhysics access kit. The ISBN number (for this book + access kit package) is 0-1361-3926-4 (ISBN-10) or 9-780-1361-3926-3 (ISBN-13). Be careful to get the right package! The publisher produces other versions of this book (split into volumes; with additional chapters for modern physics topics; etc.) The ISBN number above is the simplest way to get what you need for this course. If you're unsure about whether another version is sufficient, please check its ISBN number with me. Note that you do not need to bring the book to class.

Reading assignments will be given for nearly every class day, typically consisting of about 10 pages from the textbook. I will assume that you have done the reading before coming to class, and will not repeat everything that is in the book. Understanding all of the material in the readings, even if not covered in the lectures, is an important part of the course. For instance, you should be able to answer all of the Questions at the end of each chapter, even if not assigned as homework.

Feel free to read ahead by a few days! You could, for instance, do all of a week's reading in two sittings if you prefer. Note that if you don't have time to completely absorb a reading assignment before class, it will be best to at least read it quickly beforehand and then return to it later.

Homework:

There will usually be two reasonably short assignments each week, each of which must be completed by the beginning of class on the specified date. Students in 171H will have extra homework. Most of the homework will use the MasteringPhysics online system, but you will also turn in handwritten problems on paper to be checked. The details of how that will work will be explained during the first class session. You can work on the homework together with a classmate as long as the end result is that you master the material and turn in your own work. Copying is cheating; on the other hand, having a friend help you figure out how to solve a problem can be a good learning strategy.

Don't wait until the last minute to start a homework assignment! In fact, try to start it early so that you can ask for help if you need it. Please do all of the homework and turn it in on time, unless you have a valid excuse (i.e. illness, a religious observance, or some other compelling reason). I know that things sometimes come up (*e.g.*, exams and important deadlines in other courses), so I will give you up to four free extension days (total for the semester) with no excuse necessary. Beyond that, if you do not have a valid excuse, you can still turn in the homework up to 24 hours late for half credit; after 24 hours, no credit will be given.

Exams:

There will be four exams during the semester plus a final exam. **The final exam will be given on Thursday, December 18 from 8:00 to 10:00 in our regular classroom (room 1201).** The exams will be given in class, on paper, and will be closed-book. Any physical constants or data that you may need will be provided. You will need a calculator with standard trigonometry functions. Exams must be taken on the scheduled days unless you have a valid excuse. If you know in advance that you will have to miss an exam, please inform me as soon as possible so that we can arrange a make-up. Note that the make-up exam will be identical to the regular exam; I will trust you and your classmates to not allow the contents of the exam to leak out to someone who still has to take it.

Course grade:

| | |
|-----|-------------------------------|
| 40% | Homework |
| 10% | Each exam during the semester |
| 20% | Final exam |

How to do well in this course:

Come to the lectures. Participate in class discussions. Keep up with the reading—try to read some at least three or four times per week. Start the homework early enough so that you can finish it all. Ask for help (your teacher, TA, or a classmate) whenever there is something you don't understand. Also ask about anything you are curious about. Review your notes and past homeworks before each exam.

Contact Information:

Prof. Peter S. Shawhan, room 4205B in the Physics Building, 301-405-1580, pshawhan@umd.edu
 Office hours: Mondays 1:30-3:30, Wednesdays 2:00-3:00 and 4:00-5:30, and Fridays 4:00-5:30
 TA: Yi Wang, room 4223 in the Physics Building, ywang123@umd.edu
 Office hours: Tuesdays 11:00-12:00

*** NOTE: Office hours are subject to change – watch for announcements

If you are unable to come during regular office hours, please contact us by email or phone to ask a question and/or arrange a time to meet.

Honor Code:

The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.studenthonorcouncil.umd.edu/whatis.html>.

Religious observances:

If you need to miss class, a homework deadline, or an exam due to a religious observance, please notify me in advance—preferably at the beginning of the semester.

Students with disabilities:

Accommodations will be provided to enable students with disabilities to participate fully in the course. Please discuss any needs with me at the beginning of the semester so that appropriate arrangements can be made.

Weather and emergency closures:

If the University is closed due to weather or some emergency situation on a day when homework is due, then that homework must be turned in at the beginning of the next class when the University is open. If the University is closed on the scheduled date of an exam, then the exam will be given during the next class period when the University is open. If the University is closed on any non-exam day, including a review session (the class immediately before an exam), then the exam will still be given according to the original schedule. In these or other exceptional circumstances, I will attempt to send out information by email.

Physics 171 / 171H Course Schedule
 Fall 2008 — Professor Shawhan
 (Revised December 8)

| Date | HW due | Pre-lecture reading | Lecture topic(s) |
|------------|--------|--------------------------|--|
| Tue Sep 2 | | — | What you need to know about the course |
| Thu Sep 4 | HW 1 | 1-intro through 1-7 | Measurement and units |
| Fri Sep 5 | | 2-intro through 2-5 | Motion in one dimension |
| Mon Sep 8 | HW 2 | 2-6 through 2-8 | Solving problems with acceleration |
| Tue Sep 9 | | 3-intro through 3-5 | Vectors and coordinate systems |
| Thu Sep 11 | HW 3 | 3-6 through 3-9 | Motion in two and three dimensions |
| Fri Sep 12 | | 4-intro through 4-5 | Newton's laws of motion |
| Mon Sep 15 | HW 4 | 4-6 through p. 98 | Various forces |
| Tue Sep 16 | | p. 99 through 4-8 | Solving problems with forces |
| Thu Sep 18 | HW 5 | 5-intro, 5-1, 5-6 | Friction and drag |
| Fri Sep 19 | | 5-2 through 5-5 | Circular motion |
| Mon Sep 22 | HW 6 | — | Review and discussion |
| Tue Sep 23 | | — | Exam 1 |
| Thu Sep 25 | | 6-intro through 6-3 | Gravitational force |
| Fri Sep 26 | | 6-4 through p. 152 | Orbits |
| Mon Sep 29 | | p. 153 through 6-8 | Gravitational fields and tides |
| Tue Sep 30 | HW 7 | 7-intro through 7-3 | Work |
| Thu Oct 2 | HW 8 | 7-4, 8-8 | Kinetic energy; Power |
| Fri Oct 3 | | 8-intro through 8-3, 8-9 | Potential energy |
| Mon Oct 6 | HW 9 | 8-4 through 8-7 | Conservation of energy |
| Tue Oct 7 | | 37-1, 37-2 | Quantization of energy |
| Thu Oct 9 | HW 10 | 9-intro through 9-3 | Linear momentum |
| Fri Oct 10 | | — | Synthesis: work, energy, and momentum |
| Mon Oct 13 | HW 11 | 9-4 through 9-7 | Collisions |
| Tue Oct 14 | | 9-8, 9-9 | Center of mass; Reference frames |
| Thu Oct 16 | | — | Review and discussion |
| Fri Oct 17 | HW 12 | — | Exam 2 |

(continued on next page)

| Date | HW due | Pre-lecture reading | Lecture topic(s) |
|---------------------------|------------------------|--------------------------------|---|
| Mon Oct 20 | | 36-1 through 36-3 | Relativity |
| Tue Oct 21 | | 36-4 | Relativity of Simultaneity tutorial |
| Thu Oct 23 | | 36-5, 36-6 | Implications of relativity |
| Fri Oct 24 | HW 13 | 36-7, 36-8 | Spacetime diagrams and Lorentz transformation |
| Mon Oct 27 | | 36-9 through 36-11 | Relativistic momentum and energy |
| Tue Oct 28 | HW 14 | 10-intro through 10-3 | Rotational motion |
| Thu Oct 30 | HW 15 | 10-4 through 10-7 | Torque and moment of inertia |
| Fri Oct 31 | | 10-8 through 10-10 | Rotational kinetic energy and rolling |
| Mon Nov 3 | HW 16 | 11-intro through 11-3 | Angular momentum |
| Tue Nov 4 | | 11-4 through 11-6 | Angular momentum and torque |
| Thu Nov 6 | Study Exam 2 solutions | | Revisit Exam 2 (Extra credit opportunity) |
| Fri Nov 7 | | 11-7 through 11-9 | Gyroscopes; Rotating reference frames |
| Mon Nov 10 | HW 17 | — | Review and discussion |
| Tue Nov 11 | | — | Exam 3 |
| Thu Nov 13 | | 12-intro through 12-3 | Static equilibrium |
| Fri Nov 14 | | 12-4, 12-5 | Elasticity |
| Mon Nov 17 | HW 18 | 13-intro through 13-5 | Density and pressure in fluids |
| Tue Nov 18 | | 13-6, 13-7 | Pressure gauges; Buoyancy |
| Thu Nov 20 | HW 19 | 13-8 through 13-11 | Fluids in motion |
| Fri Nov 21 | | 17-intro through 17-5 | Temperature, thermal expansion, thermometers |
| Mon Nov 24 | HW 20 | 17-6 through 17-10 | The ideal gas law |
| Tue Nov 25 | | 18-intro through 18-2 | Kinetic theory of gases |
| Thu Nov 27 | | <i>Thanksgiving — No class</i> | |
| Fri Nov 28 | | <i>Thanksgiving — No class</i> | |
| Mon Dec 1 | HW 21 due 5pm | 18-3 through 18-5 | Phase changes and phase diagrams |
| Tue Dec 2 | | 18-6, 18-7 | Diffusion |
| Thu Dec 4 | HW 22 | — | Review and discussion |
| Fri Dec 5 | | — | Exam 4 |
| Mon Dec 8 | | 19-intro through 19-4, 19-10 | Heat |
| Tue Dec 9 | | 19-5, 19-6, 20-1, 20-2, 20-4 | Laws of Thermodynamics; Heat engines |
| Thu Dec 11 | | — | Course review and discussion – part 1 |
| Fri Dec 12 | HW 23 | — | Course review and discussion – part 2 |
| Thu Dec 18, 8:00–10:00 am | | | Final exam in our regular classroom |

Notes about MasteringPhysics

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Registering

Assuming that you bought the specified version of the textbook, it should have been packaged with a slim cardboard “Student Access Kit” for MasteringPhysics. Inside it are an access code and instructions for registering. (If you bought a version of the book that didn’t come with an Access Kit, you can purchase access on the MasteringPhysics web site.) Go to www.masteringphysics.com and follow the directions in the Access Kit. The first step is to register: you’ll choose a username and password, and enter your name, email address, and school (choose United States, zip code 20742, and then select “UNIV MARYLAND COLLEGE PARK”). Once you have registered, you can log in and “enroll” in our specific course. Enter your Student ID (the 9-digit number on the front of your University ID card, beginning with either “10” or “11”) and the Course ID: SHAWHAN2008PHYS171 if you are in the regular section, or SHAWHAN2008PHYS171H if you are in the honors section.

Using MasteringPhysics

When you log in, you will see a screen with “Assignment List” and several other tabs along the left edge, and “Home” and a few other tabs at top right. One of the tabs at top right is “Help”, which will give you information about navigating the web interface, etc. The first homework assignment (which you’ll see when you click on “Assignment List”) is a tutorial which teaches you how to use MasteringPhysics. Each assignment contains a number of “items”, and a given item can contain multiple parts. When you have done all of the parts for an item, be sure to click on the “submit item” button at the bottom of the page. When you do that, you will see your score for the item, which is calculated from the average score from the individual parts. There is also an “Item Survey” which gives you an opportunity to provide feedback on the item; you don’t normally have to do that, but you can if you want to.

How assignments will be graded

MasteringPhysics automatically calculates grades based on your answers, but the grading system can be confusing because the rules for giving partial credit are controlled by a handful of settings that are up to the instructor. Here is how I plan to set up the grading:

- You get a maximum of six attempts to answer each part. For symbolic or numeric questions, each wrong answer before the correct one reduces your score on that part by 10%. For multiple-choice questions, each wrong answer before the correct one reduces your score by the fraction $1/(n-1)$, where n is the number of answer choices.
- There is no penalty for opening a hint. However, if you answer the part correctly *without* opening a hint, you get a *bonus* of 3% per unopened hint. (You can even look at the list of hint topics without actually opening any of them.)
- If you open a hint that contains a question, and you answer that question incorrectly, then your score is reduced by 10%. There is no penalty for leaving a hint question unanswered.

You can click on “View Grading Details” at the top of an assignment to check the settings that apply to the assignment. Note that my provisions for extension days (four free) and unexcused late homework (half credit if turned in up to 24 hours late) won’t be handled by MasteringPhysics, but will have to be adjusted manually.