

Physics 121: Fundamentals of Physics I — Fall 2012

Sections 0101 to 0109 — Professor Shawhan

The most up-to-date version of the syllabus can always be found on ELMS
or at <http://tinyurl.com/shawhan121>

Contact Information

Prof. Peter S. Shawhan, room 4205B in the Physics Building, pshawhan@umd.edu, 301-405-1580

If you have a question or issue that can't be handled during office hours, please email or call me.

Teaching Assistants: Anirban Gangopadhyay, Guil Miranda, Conner Roncaioli, Ana Valdes Curiel,
Sharon Wall, Chaio-Hsuan Wang

Instructor in charge of the labs: Dr. Matthew Bobrowsky, msb@umd.edu

All office hours will be held in the Course Center, room 0208. The schedule will be posted online.

Overview

The purpose of this class is to give you a deep understanding of the fundamental principles that govern physical systems, how they may be used to accurately predict the behavior of objects when they interact with their environment, and how these simple principles lead to more complex phenomena. Topics will include acceleration, force, Newton's laws of motion, drag, friction, gravity, momentum, energy, torque, elasticity, fluids, gases, and thermodynamics. Besides the physics concepts themselves, this course is also designed to develop your general ability to think analytically and converse about physical systems; exactly what that means will become clearer as the class goes along.

Lectures will be given on Mondays, Wednesdays, and Fridays from 10:00–10:50 in room 1412 in the Physics lecture halls wing. These sessions will actually be fairly interactive—please come ready to think and respond, not just to take notes!

You will also have a one-hour **discussion session** and a two-hour **lab session** each week, with some exceptions at the beginning of the semester and in the week of Thanksgiving. The discussion session, which meets in room 3301, is structured as a sequence of **tutorials** designed to help you explore and solidify the physics principles and their consequences, collaborating with your classmates and TA. The lab sessions, in room 3312, present you with rather open-ended investigations that you must plan, carry out, evaluate and explain in teams—there is no “cookbook” for them! You must attend the specific tutorial and lab sessions for the course section you registered for. If you miss your normal day for a valid reason (such as illness), contact me (not just your TA) right away. At the end of the semester there will be an opportunity to make up *one* lab session if you missed one for a valid reason during the semester.

The **Course Center** is a room in the main Physics Building (room 0208) dedicated to PHYS 121 (and PHYS 131) as a place for studying, open discussion about the course, and working on homework together with your classmates. Your TAs and I will have all of our office hours in the Course Center, as will our undergraduate Learning Assistants (LAs), the lecturers for the other sections, and their TAs. This will allow us to open and staff the Course Center for many hours each week; a schedule will be posted during the second week of classes. The Course Center is also where you will go to pick up your graded papers. Feel free to come by any time for help, though it may be best if you can come when I or one of the TAs or LAs working with the 010x sections are there. Other help resources are listed near the end of this syllabus.

Required and Optional Course Materials

The **textbook** for this course is “College Physics: A Strategic Approach” by Knight, Jones and Field, published by Addison-Wesley / Pearson. It is available either as a single hardcover volume or as two paperback volumes. I recommend the paperback option because it is easier to carry around one of those than the big hardcover, but either is OK. PHYS 121 will cover material corresponding to the first 13 chapters, which is all in volume 1 of the paperback edition. The current edition of the book is the second edition, but the first edition is very similar and is an acceptable substitute that you could obtain used; *however*, before you run out and buy or rent a used copy of either edition, **carefully read below about bundled items which affect the economics of buying a new versus a used book**. Note that there are actually two versions of the second edition: the original, and a “technology update” which mainly has added QR codes to view online video demonstrations. I’m not requiring that, so either version will be fine.

New copies of the textbook are available in a number of packages, bundled with various add-ons, with different ISBN numbers. The most important add-on for this course is MasteringPhysics, a web-based homework system that is a *required* part of this course. When MasteringPhysics access is purchased with a book, it is valid for two years and includes an “eText” version of the book that you can read online if you don’t have your book with you. MasteringPhysics access can also be purchased separately at masteringphysics.com for about \$60 for a two-year subscription, though that does *not* include the eText. So that \$60 would be an additional cost if you buy a used copy of Knight/Jones/Field (unless it happens to include an unused second-edition MasteringPhysics access code). *Note*: if you do purchase MasteringPhysics access separately, be sure to specify that the textbook you are using is Knight/Jones/Field **second edition** (even if you bought a used copy of the first edition printed book!) to match the way the online course was set up. If you make a mistake and specify the wrong edition, contact MasteringPhysics customer support.

The bookstore is selling a bundle which includes the volume 1 paperback, MasteringPhysics (with the eText), a workbook, and a study guide book called “Get Ready for Physics”. In this bundle, MasteringPhysics added less than \$10 to the cost, and the publisher threw in the workbook and study guide at no extra cost. The workbook and study guide are *not* required for this course, but some students may find them helpful. The ISBN for this bundle is 978-0-321-82999-3 (or 978-0-321-74134-9 for the original second edition). Besides the University Book Center and Maryland Book Exchange (which are probably selling it at ~5% below list price), it is also available directly from the publisher at mypearsonstore.com.

The minimal bundle for PHYS 121, consisting of just the volume 1 paperback plus MasteringPhysics access (including the eText), has ISBN 978-0-321-84153-7 (or 978-0-321-59850-9 for the original second edition). Other bundles (with different ISBNs) may be available which include just the workbook or just the study guide. If you’re unsure whether some bundle is suitable, please check with me. Note that if you buy the bundle with the volume 1 printed book, the eText contains the *entire* book, not just volume 1.

You may be tempted to consider buying an electronic version of the book *instead of* a printed copy, either through MasteringPhysics (for an extra charge) or through coursesmart.com. However, I recommend buying a printed book instead of just an eBook subscription! First of all, the higher-quality type in a printed book is easier to read than pixels on a screen, and a physical book is easier to flip through. Second, the eBook subscriptions expire after 18 or 24 months, and then you have nothing to show for the money you spent. A printed book can, at least, be sold if you don’t want to keep it.

In addition to the textbook, you will need a copy of the “Physics 121 Tutorials and Laboratories” manual, which is a U. of Maryland custom book published by Wiley with ISBN 978-0-470-10771-3. Note: if you

want to buy a used copy of this, **it must not have been written in!** Working through the tutorials involves a lot of writing in your manual.

Finally, for this course you will need to have a “clicker”, or else a web-enabled phone (or other device) with a ResponseWare license that you can use in place of a clicker. You will also need to register your clicker (or other device) at <http://my.umd.edu> so that it is associated with your student ID. For details and purchasing information, go to <http://clickers.umd.edu/> and click on the “Students” tab. The “RF-LCD” model is currently preferred, though the older RF and XR models will also work if you already own one.

To summarize: the *required* materials for PHYS 121 are the textbook; MasteringPhysics access; the tutorials/labs manual; and an approved clicker or ResponseWare-enabled device.

MasteringPhysics registration and enrollment

The regular textbook bundle includes a slim cardboard “Student Access Kit” with an activation code for MasteringPhysics. Alternatively, you can purchase a MasteringPhysics subscription separately at www.masteringphysics.com. *Important:* If you purchase a subscription online, be sure to specify the standard textbook for the course: Knight/Jones/Field, College Physics, **2nd edition** (even if you are using a printed copy of the 1st edition book); otherwise the MasteringPhysics registration system will not let you enroll in our course. Once you have registered, you can log in and “join” 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: SHAWHAN2012 .

Graded work

Homework will be assigned each week. Most assignments will have a combination of “warm-up” MasteringPhysics items plus a handful of multi-part questions to be answered on paper and turned in.

Lab work will be graded partly on your team’s lab reports and partly on your individual efforts.

You will also earn points for **participation** in class and tutorials, plus completing a few surveys.

Three **midterm exams** will be given in class, plus a **final exam** at the end of the semester.

Course grade break-down:

7%	Participation (class participation, clicker questions, tutorial attendance, surveys)
23%	Homework (including MasteringPhysics and tutorial-related homework)
20%	Labs
30%	Midterm exams (10% each)
20%	Final exam

Note on participation:

Class participation is designed mainly to get your mind actively involved so that you will improve your understanding of the material and do better on the exams. As an added incentive, a small part of your grade comes from “clicker question” participation. You must only use your own clicker – “clicking in” for a friend who is absent is prohibited! I will make adjustments for any technical problems – let me know if any occur.

How written homework will be graded:

A typical homework assignment will include about 5 multi-part questions to be answered on paper and turned in. We will scan all your papers to keep a backup copy, then divide them up by questions so that

each question (from all students) will be graded by a single TA. In order for us to scan, handle and grade your papers efficiently, please start each question on a new sheet of paper, write your name on every sheet, and **do not use any staples or paper clips** when turning them in. You may answer all parts of a given question on the same sheet, and you may write on both sides of the sheet (and/or use multiple sheets, if needed) as long as it is all part of the same question. Blank office paper is preferred and is available in the Course Center, but notebook paper is OK as long as you can tear or cut it to have a clean left edge – no ragged edge from tearing out of a spiral notebook, please! Clarity of presentation and neatness do count; points may be deducted for sloppy writing or ragged paper edges.

How MasteringPhysics items will be graded:

MasteringPhysics automatically calculates decimal scores based on your answers (except for free response answers), but the rules for giving partial credit can be confusing. Here is how I will 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 25%.
- There is no penalty for opening a hint; you can get full credit even if you use all the hints. However, if you answer the part correctly *without* opening a hint, you get a token *bonus* of 2% 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 for that hint is reduced by 10%. On the other hand, if you answer a question in a hint correctly, then you *gain* some credit even if you are unable to answer the original question in that part correctly. You'll gain even more if consulting the hint allows you to answer the original question correctly! There is no penalty for leaving a hint question unanswered.

You can always click on the “Grading Policy” link at the top of an assignment to check the settings that apply to the assignment. If you think you have lost points unfairly for some technical reason, let me know what happened and I will look at the log of your answers and make an adjustment if appropriate.

In addition to online items the MasteringPhysics grades automatically, there may be some items that ask you to type in explanations. Those will be read and graded by the TAs.

Grade recording:

Scores on all of your assignments will be recorded on ELMS soon after grading is complete. Since different TAs and I will be grading different parts of each homework assignment or exam, it can take a little longer to collect all the parts and add them together. I will try to control the visibility of ELMS gradebook items so that when you see a score, it is an accurate sum of all the parts. We will aim to post your total scores and return graded work to you within a week or so. Please check your scores periodically using the “My Grades” menu link in ELMS and let me know as soon as possible if you think there is an error; I will do my best to investigate and correct mistakes.

Course Policies

Late or missed work:

Assignments must be completed and turned in when they are due unless you have a valid excuse according to university policy, *e.g.* illness, in which case an extension will be granted. Please let **me** (not just your TA) know your situation as soon as possible, and I will tell you if I need documentation for the reason for your absence. No credit will be given for work turned in late without a valid excuse. In the case of illness, we will follow the university policy posted at <http://www.president.umd.edu/policies/v100g.html>: The *first* time you miss a due date during the semester, I will accept a self-signed note from you (without a doctor's note) explaining the dates of your illness and stating that the information is true and correct. If illness

causes you to miss more than one due date during the semester, or to miss an exam, I will require a doctor's note. If you do miss an exam, I will schedule a make-up time with you as soon as possible—it starts to cause problems if it's more than a few days later. In any case, whatever the reason for your absence, it is important that you contact me as soon as you reasonably can.

Policy on Collaborating:

Working together with other students is part of the course; in fact, the tutorials and labs are specifically designed around teamwork. Working together to figure out the homework is also encouraged, but you must do and turn in **your own work!** This simple rule applies: **Never look at someone else's written solution.** That applies to your classmates as well as anything you may find on the web. Talking about how to work the problem is fine if it helps you to understand it better, but copying a solution is strictly forbidden (and will not enable you to succeed on the exams). Work that appears to have been copied will receive zero credit and may lead to administrative actions (see below).

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. I will ask you to sign the Honor Pledge on exams; I won't ask you to sign it on each homework assignment, but it should be understood that the Honor Code still applies to homework. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. Violations will be taken very seriously and may result in an XF grade for the course and possible suspension. As your teacher, I have an obligation to uphold the Honor Code and have had to submit some Academic Integrity Referrals in past years, unfortunately, which led to XF grades. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://shc.umd.edu/SHC/Default.aspx> .

Religious observances:

If you need to miss class, tutorial, lab, a homework deadline, or an exam due to a religious observance, please notify me in advance—preferably at the beginning of the semester—so that we can make appropriate arrangements.

Students with disabilities:

Accommodations will be provided to enable students with documented 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 just before an exam, then the exam will still be given according to the original schedule. If for some reason the University is closed for an extended period, I will continue the course by recording video lectures and posting them on the web, and will ask you to watch them, read, and do tutorial and homework assignments on your own. In these or other exceptional circumstances, I will attempt to send out information by email.

Course announcements by email:

I will occasionally send important announcements to the class, specifically to each student's **umd.edu** email address. If you use some other email system, please make sure that mail sent to your umd.edu address is successfully forwarded to the address you use most regularly.

Privacy:

You have a right to privacy of your educational records, including the fact that you are enrolled in this course, but I hope you won't mind if the TAs and I may call you by name in the presence of other students. If that may be an issue or if you are ever uncomfortable with the class environment, please don't hesitate to let me know. One issue in principle is that we will be returning graded homework and exam papers in the Course Center. I ask all students to honor the privacy of your classmates by not looking at or picking up anyone else's papers, unless *explicitly* asked by a friend to pick up their homework. If you want, please feel free to write just your initials or some other code name on your papers (along with your section number) and send me a quick email the first time you do, so we'll know which is yours from then on.

Help Resources

I encourage you to visit the Course Center anytime it is open. The schedule will be posted on the main course page in ELMS, also viewable by going to <http://tinyurl.com/shawhan121> .

The university's Learning Assistance Service will be providing Guided Study Sessions (GSS) for our course, led by an undergraduate student who took the course before—and did well—and is now ready to help you learn. More details will be announced in class.

The Slawsky Physics Clinic is staffed by volunteers who offer free assistance with studying and homework from 10:00 to 3:00 in rooms 1208/1214. Just keep in mind that most of the staff there may not be specifically following our course, so they may not be as tuned into our homework problems and schedule as the TAs and LAs in the Course Center.

If you are interested in hiring a private tutor, the Physics Department maintains a list of people who offer such services – see <http://umdphysics.umd.edu/academics/tutoring-a-academic-support.html> .

Note: Although you may get help in many forms, remember the Policy on Collaborating described above! Please remind the people you are working with that they should explain and help you learn, not simply show you the answer to a problem, since you are not allowed to copy anyone else's written answer (and you wouldn't learn much, if anything, from it). Also, it is ultimately your responsibility to understand and arrive at (your own) correct answers. There is not much I can do if someone else gives you an ambiguous or incorrect line of reasoning, and even professionals make mistakes from time to time. Therefore, receive help with a healthy skepticism and cross-check your understanding to make sure it really holds together.

If you are experiencing difficulties in keeping up with the academic demands of this course and/or your overall course load, I encourage you to contact the Learning Assistance Service, 2202 Shoemaker Building, 301-314-7693. Their educational counselors can help with time management, reading, math learning skills, note-taking and exam preparation skills. All of their services are free to UMD students.

Copyright Protection of Course Materials

I hope you get a lot out of this course, but not by taking and selling the course materials! ☺ Please understand that my lecture slides, handouts, homework and exam problems and solutions, and the lectures themselves (including audio and video recordings) are copyrighted by me and may not be distributed or reproduced for anything other than your personal use without my written permission.

* Each HW assignment has a related Warm-up due 24 hours earlier

Physics 121 Course Schedule

Fall 2012 — Professor Shawhan

v1

	<i>HW due*</i>	<i>Lecture topic</i>	<i>Book sections</i>	<i>Tutorial</i>	<i>Lab</i>
Aug 29		All about the course			
Aug 31	Warm-up 0	Representing position and motion	1.1–1.3		
Sep 3		** Labor Day — No class **			
Sep 5		Graphing motion; Acceleration	2.1–2.4		
Sep 7	HW 1	The case of constant acceleration	2.5–2.7	** Tutorials and labs begin Sep 10: **	
Sep 10		Relative motion; Units; Uncertainty	3.5; 1.4	Interpreting graphs and equations	Reaction Time
Sep 12		Forces and mass: Newton's laws	4.1–4.2, 4.5–4.6		
Sep 14	HW 2	Springs, strings, and atoms	4.3–4.4, 8.3		
Sep 17		Solving problems with Newton's laws		Newton's third law	Grandfather Clock, part 1
Sep 19		Newton's third law	4.8, 5.7		
Sep 21	HW 3	Apparent weight	5.3		
Sep 24		Drag	5.6	Reconciling common sense and Newton's laws	Grandfather Clock, part 2
Sep 26	HW 4	Review and discussion			
Sep 28		Exam 1			
Oct 1		Vectors in physics; Sideways accel.	3.1–3.3	Velocity and acceleration in two dimensions	Let it Roll
Oct 3		Newton's laws in 2-D	4.7; 3.6–3.8		
Oct 5	HW 5	Using Newton's laws in 2-D	5.2, 5.4, 5.8		
Oct 8		Friction	5.5	The purpose of free-body diagrams	Let it Slide, part 1
Oct 10		Circular motion and forces	6.3–6.4		
Oct 12	HW 6	Gravity and orbits	6.5–6.7		
Oct 15		Impulse and momentum	9.1–9.3	Relating equations to common sense: "Oomph"	Let it Slide, part 2
Oct 17		Conservation of momentum	9.4–9.6		
Oct 19	HW 7	Work, energy, and power	10.1, 10.2, 10.8		
Oct 22		Kinetic and potential energy	10.3, 10.4	Work and energy	No Free Launch, part 1
Oct 24		Conservation of energy	10.6, 10.7		
Oct 26	HW 8	Review and discussion			
Oct 29		Exam 2		Common sense and equations: Torque	No Free Launch, part 2
Oct 31		Rotational motion and torque	7.1–7.3		
Nov 2		Rotational dynamics	7.4–7.6, 9.7, p. 300		
Nov 5	HW 9	Equilibrium and balance	8.1, 8.2	Properties of matter	Roller Coaster, part 1
Nov 7		Elasticity and strength of materials	8.4		
Nov 9		Linear response systems			
Nov 12	HW 10	Density and pressure in fluids	13.1–13.3	Making sense of pressure in a liquid	Roller Coaster, part 2
Nov 14		Buoyancy; Fluids in motion	13.4, 13.5		
Nov 16		Viscosity and fluid flow in tubes	13.6, 13.7		
Nov 19	HW 11	Thermal energy and temperature	11.4, 11.5 (part)	** No tutorial or lab **	
Nov 21		Gas pressure and the ideal gas law	12.1, 12.2		
Nov 23		** Thanksgiving holiday — No class **			
Nov 26		Gas processes; Thermal expansion	12.3, 12.4	Gases in containers	Gravity, part 1
Nov 28	HW 12	Review and discussion			
Nov 30		Exam 3			
Dec 3		Energy usage in living systems	11.1–11.3	Heat and temperature	Gravity, part 2
Dec 5		Heat flow	11.5, 12.8		
Dec 7		Using thermal energy; Entropy	11.6–11.9		
Dec 10	HW 13	Course discussion and review		** No tutorial or lab **	
Dec 19		Final Exam: 8:00–10:00 a.m.			