

Physics 121: Fundamentals of Physics I — Fall 2011

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>

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 ability to think analytically 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 a few 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 3306, 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 a few days after the beginning 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.

The university's Learning Assistance Service is also 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.

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 a used copy of either edition, **carefully read below about bundled items which affect the economics of buying a new versus a used book:**

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 \$56 for a two-year subscription, though that does *not* include the eText. So that \$56 would be an additional cost if you buy a used copy of Knight/Jones/Field that does not include an unused 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). If you make a mistake and specify the wrong edition, contact MasteringPhysics customer support.

We have arranged for the bookstore to sell 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 978-0-321-74134-9. Besides the University Book Center and Maryland Book Exchange (which are selling it at 5 or 6% 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 978-0-321-59850-9. Other bundles (with different ISBNs) may be available which include just the workbook or just the study guide. Note that the eText contains the *entire* book even if it is bundled with 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 strongly 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 a clicker or suitable alternative.

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: SHAWHAN2011 .

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 tutorial homework) |
| 20% | Labs |
| 30% | Midterm exams (10% each) |
| 20% | Final exam |

How written homework will be graded:

A typical homework assignment will include about 4 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 will 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.

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 will 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. When different people are grading different parts of a homework assignment or an 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. 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 turn in **your own work!** This simple rule applies: **Never look at someone else’s written solution.** Talking about how to work the problem is fine if it helps you to understand it better, but copying a solution is strictly forbidden.

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. 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. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.studenthonorcouncil.umd.edu/SHC/Default.aspx> .

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 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 videotaping 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.

Contact Information

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

Office hours (in the Course Center): to be determined – schedule will be posted on ELMS

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

Teaching Assistants:

Sections 0101 and 0102: Kimberly Moore, kmoore17@umd.edu

Sections 0103 and 0107: Michael Hull, mhull12@umd.edu

Sections 0104 and 0108: Nathaniel Steinsultz, nsteins@umd.edu

Section 0105: Guilherme Miranda, gmiranda@umd.edu

Sections 0106 and 0109: Steven Lynam, slynam@umd.edu

Office hours (in the Course Center): to be determined – schedule will be posted on ELMS

Faculty member in charge of the labs:

Prof. Dieter Brill, room 4202 in the Physics Building, brill@umd.edu, 301-405-6027

Copyright Protection of Course Materials

I hope you get a lot out of this course, but not by taking and selling the course materials! ☺

Unless indicated otherwise, my lecture slides, handouts, exams, homework and exam 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.

Physics 121 Course Schedule

Fall 2011 — Professor Shawhan

v4

| | <i>HW due</i> | <i>Lecture topic</i> | <i>Book sections</i> | <i>Tutorial</i> | <i>Lab</i> |
|--------|---------------|--|----------------------|---|--|
| Aug 31 | | All about the course | | ** No tutorial ** | |
| Sep 2 | HW 0 | Representing position and motion | 1.1–1.3 | | ** No lab – but do survey by Sep 6 ** |
| Sep 5 | | ** Labor Day — No class ** | | <i>Tutorials begin Wednesday, Sep 7:</i> | |
| Sep 7 | | Graphing motion; Acceleration | 2.1–2.4 | | |
| Sep 9 | HW 1 | The case of constant acceleration | 2.5–2.7 | The meaning of speed | <i>Labs begin Sep 12:</i> |
| Sep 12 | | Numbers, units, and uncertainty | 1.4 | | |
| Sep 14 | | Force and mass: Newton's laws | 4.1, 4.2 | | Reaction Time |
| Sep 16 | HW 2 | Springs, strings, and atoms | 4.3, 4.4, 8.3 | Interpreting graphs and equations | |
| Sep 19 | | Solving problems with Newton's laws | 4.5, 4.6 | | |
| Sep 21 | | Newton's third law | 4.8, 5.7 | | Grandfather Clock, part 1 |
| Sep 23 | HW 3 | Apparent weight | 5.3 | Newton's third law | |
| Sep 26 | | Drag | 5.6 | | |
| Sep 28 | | Vectors in physics; Relative motion | 3.1–3.3; 3.5 | | Grandfather Clock, part 2 |
| Sep 30 | HW 4 | Sideways acceleration | 3.6–3.8 | Reconciling common sense and Newton's laws | |
| Oct 3 | | Review and discussion | | | |
| Oct 5 | | Exam 1 | | | Let it Roll |
| Oct 7 | | Newton's laws in 2-D | 4.4–4.7 | Velocity and acceleration in two dimensions | |
| Oct 10 | | Using Newton's laws in 2-D | 5.2, 5.4, 5.8 | | |
| Oct 12 | HW 5 | Friction | 5.5 | | Let it Roll, continued |
| Oct 14 | | Circular motion and forces | 6.3–6.4 | The purpose of free-body diagrams | |
| Oct 17 | | Gravity and orbits | 6.5–6.7 | | |
| Oct 19 | HW 6 | Momentum | 9.1–9.3 | | Endangered Creatures |
| Oct 21 | | Conservation of momentum | 9.4–9.6 | Relating equations to common sense: "Oomph" | |
| Oct 24 | | Work, energy, and power | 10.1, 10.2, 10.8 | | |
| Oct 26 | HW 7 | Kinetic and potential energy | 10.3, 10.4 | | No Free Launch, part 1 |
| Oct 28 | | Conservation of energy | 10.6, 10.7 | Work and energy | |
| Oct 31 | | Review and discussion | | | |
| Nov 2 | HW 8 | Exam 2 | | | No Free Launch, part 2 |
| Nov 4 | | Rotational motion and torque | 7.1–7.3 | Common sense and equations: Torque | |
| Nov 7 | | Rotational dynamics | 7.4, 7.5, 9.7 | | |
| Nov 9 | | Equilibrium and balance | 8.1, 8.2 | | Roller Coaster, part 1 |
| Nov 11 | HW 9 | Elasticity and strength of materials | 8.4 | Properties of matter | |
| Nov 14 | | Density and pressure in fluids | 13.1–13.3 | | |
| Nov 16 | HW 10 | Buoyancy; Fluids in motion | 13.4, 13.5 | | Roller Coaster, part 2 |
| Nov 18 | | Viscosity and fluid flow in tubes | 13.6, 13.7 | Making sense of pressure in a liquid | |
| Nov 21 | | Thermal energy and temperature | 11.4 | | |
| Nov 23 | HW 11 | Gas pressure and the ideal gas law | 12.1, 12.2 | | ** No lab Nov 21–25 ** |
| Nov 25 | | ** Thanksgiving holiday — No class ** | | ** No tutorial Nov 23–25 ** | |
| Nov 28 | | Gas processes; Thermal expansion | 12.3, 12.4 | | |
| Nov 30 | HW 12 | Review and discussion | | Gases in containers | Gravity, part 1 |
| Dec 2 | | Exam 3 | | | |
| Dec 5 | | Energy usage in living systems | 11.1–11.3 | | |
| Dec 7 | | Heat flow, and similarity to diffusion | 11.5, 12.8 | Heat and temperature | Gravity, part 2 |
| Dec 9 | HW 13 | Using thermal energy; Entropy | 11.6–11.9 | | |
| Dec 12 | | Course discussion and review | | ** No tutorial ** | ** No lab ** |
| Dec 21 | | Final Exam: 8:00–10:00 a.m. | | | |