

Syllabus for Physics 210, fall 2019 (evening)

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- corequisite** The corequisite is Math 150A (first-semester calculus).
- office hours** The following office hours are in room 415-P (not my office): M 8:30-9:30, T 9-10, 4:30-5:30, W 8:30-9:30, R 9-10, 4:30-5:30. I urge you to pick at least one of these office hours to come to every week as part of your habitual schedule. When you show up to my office hours for help with homework, I expect you to bring both the book and your own copy of your reading notes (see below).
- web page** www.lightandmatter.com/area3phys205.html
To e-mail me, use your Spotter account.
- required materials** The texts are volume 1 of *Light and Matter* and the lab manual. You'll also need a calculator, two bound lab notebooks (either $10 \times 7\frac{3}{4}$ -inch or $9\frac{3}{4} \times 7\frac{1}{2}$ -inch) with graph paper pages (across from the colored pens at the bookstore) a metric ruler, and a protractor. If you need to review your math, there are links on the class's web page to some free online books.
- getting started** Here are the things you need to do by the second class meeting:
1. Get everything listed under "required materials" above. You can buy the book at the FC bookstore or download it. Download and print the lab manual. The downloads are linked to from the class's web page.
 2. Read this syllabus.
 3. Use the link at the class's web page to get a printout of your homework assignments.
 4. Consult the schedule on page 5. Do the listed reading and the homework problems. Take notes on the reading, and print two copies of them.
- recommended weekly routine** The following is a typical way that you could allot your time for this course during a week in which there is one reading assignment and two homework assignments.

	hours
Read (first pass).	1
Read (second pass, typing notes).	0.5
Work alone on homework (first shot).	1.5 1.5
Tutoring/office hours.	0.5 0.5
Work alone on homework (second shot).	1 1
misc. (lab writeup, ...)	1
total	~ 8

grading Grades will be determined as follows:

homework	120 problems @ 0.1 point each	12
reading quizzes	39 questions @ 2 points each	78
reading notes	19 @ 1 points each	19
prelabs	10 @ 2 point each	20
check-off labs	7 @ 10 points each	70
lab writeups	5 @ 20 points each	100
exam 1 and 4	2 @ 120 points each	240
exams 2 and 3	2 @ 180 points each	360
standardized test		33

The reason for grading the homework is to give you feedback and track your progress. To avoid giving anyone an incentive to cheat by copying solutions from online or offline sources, I've made the weight assigned to the homework too low to have any significant direct effect on your grade. However, the way you learn the material in this type of course is by practicing. Therefore most students end up with about the same grades on the exams as on the homework.

points	grade
80%	A
69%	B
58%	C
47%	D

basic literacy in calculations

The following are some common mistakes in carrying out a numerical calculation.

wrong	right	
$\frac{2(1.36)}{(0.53)^2} = 9.7$	$\frac{2(1.36 \text{ m})}{(0.53 \text{ s})^2} = 9.7 \text{ m/s}^2$	Never write numbers without units. When plugging in, check that the units work out to be what you expected.
$1.37 \text{ m} = \frac{1}{2}a(0.53 \text{ s})^2$ $1.37 \text{ m} = (0.140 \text{ s}^2)a$ $a = 9.7 \text{ m/s}^2$	$x = \frac{1}{2}at^2$ $a = \frac{2x}{t^2}$ $a = \frac{2(1.37 \text{ m})}{(0.53 \text{ s})^2}$ $a = 9.7 \text{ m/s}^2$	Finish the algebra before plugging in the numbers.
Volume of one ton of helium: $V = \frac{m}{\rho}$ $V = \frac{1000000 \text{ g}}{172 \text{ g/cm}^3}$ $V = 5813.95 \text{ cm}^3$	Volume of one ton of helium: $V = \frac{m}{\rho}$ $V = \frac{10^6 \text{ g}}{172 \text{ g/cm}^3}$ $V = 5.81 \times 10^3 \text{ cm}^3$	Use scientific notation. Put your calculator in scientific notation mode. Don't waste time writing down lots of insignificant figures.

reading notes

I'll maintain a folder for you containing your notes on the reading. These are the notes you get to use on the exams. You should do the notes on a computer (for ease of revision), and do them after you read, not while reading (so that you know what ended up being the main points). I will not accept hand-written notes.

On any date when reading is assigned, you should be prepared for an open-notes quiz, and print out an extra copy of your notes on the reading; you'll turn in the copy, and I'll add it to your folder. It has to be a copy, because you need the original for your own use in studying and problem solving. I expect you to bring your own copy of your notes to school so that, e.g., we can refer to them together if you're getting help in my office hours.

Your notes need to be entirely in your own words; stating everything in your own words is a good way to test and consolidate your own understanding. Cutting and pasting from the book would be a form of cheating on exams (because the exams are not open-book), and would also be plagiarism if the copied material wasn't properly attributed.

Shorter is better. The laws of physics are fundamentally simple. I would suggest limiting yourself to no more than quarter of a page per chapter. By the end of the semester, the simple underlying structure of the material will have become more and more obvious to you, and I think you should be able to go back over your notes and edit them down to no more than about a page *total*. It's not against the rules for your notes to be too long, but it's not smart, either; long notes usually indicate that you're not distinguishing fundamental principles from trivia, or that you're making futile efforts to write a cookbook of problem-solving techniques, which is a self-defeating way to approach problem solving. If it feels too scary to walk into an exam with short notes, I suggest making a separate long version as a security blanket, but sealing them shut with a big binder clip to remind yourself that using them is probably a mistake, indicating that you aren't working from basic principles.

Google Docs for note-taking

For note-taking, I recommend that you use Google Docs, docs.google.com, which makes it easy to do equations. It works in any web browser, and you don't have to install any software. To do an equation, go to the Insert menu and choose Equation. You can then type in your math. A toolbar also comes up, just above the top of the page, with symbols in it like square roots. I found the toolbar confusing when it came to doing exponents; the easiest way to do it is to enter, e.g., x^2 for x squared. Printing works, but is a little awkward and ugly. A PDF file pops up, with your equations rendered at low resolution. You then have to print the PDF file (i.e., you have to do two print commands in order to get the output to actually go to the printer).

Spotter

Spotter is computer software I've written to help you check your answers to homework problems. It can check both numerical answers and symbolic ones. Having Spotter helps you more than having answers in the back of the book, because it is programmed to give you helpful pointers. If you put in an wrong

answer that I've anticipated, it will explain why it's wrong. If your answer doesn't make sense in terms of units, it will tell you that. If you get a wrong answer, you can redo the problem and put in the right answer later for full credit.

Problems that are underlined on the homework page of the syllabus have purely mathematical answers, and are in Spotter. To get credit for an online homework problem, you need to enter a correct answer in Spotter, and also turn in your written calculations and explanations along with the rest of the homework. What I'm really trying to do here is get you to come to my office hours and get help if you can't get the right answer — Spotter helps you by letting you know whether you have the problem right *before* you turn it in.

You don't need to install the software; you just use it through a web browser. Start from the class's web page, then click on the "homework" link to the class's Spotter page. Once you're in Spotter, make sure to log in, or else you won't get credit for your work! Once you're logged in, all your answers will be recorded.

When using Spotter, you have to be careful about the notation you use for inputting mathematical expressions. Spotter is designed to allow you to use something resembling normal human mathematical notation, as opposed to the notation used in computer programs. However, human math notation is designed for humans, not computers, and you need to learn a few things about how to type your expressions in a form that Spotter will interpret correctly.

First, everything you type will be smashed down to one line of text, eliminating the superscripts and subscripts. For example, a variable name with a subscript, like x_1 , is entered as `x1`. Since there are no superscripts, you have to enter exponents using the `^` symbol (shift-6), e.g., x^2 becomes `x^2`. You can enter a square root as either `sqrt(x)` or `x^.5`. There is no way to enter the times symbol, \times , without confusing the computer and making it think you meant the variable x , so in scientific notation you should simply leave a space where you would normally put the times symbol, e.g., 5×10^6 becomes `5 10^6`. Don't try to enter this as `5e+6`; that's what a lot of computer software would want, but Spotter is trying to interpret everything as normal human notation, so it will think you meant $5e + 6$, where e is a variable.

Human languages, including human math notation, are ambiguous. Use parentheses liberally to make your meaning clear. There are two main situations where you need to watch out. First, arguments to functions: `sin 2x` will be interpreted as $(\sin 2)(x)$; if you intended $\sin(2x)$, you should have entered `sin(2x)`. Second, the bottom of fractions: `1/3c` will be interpreted as $(1/3)c$, so if you want $\frac{1}{3c}$, you need to enter `1/(3c)`.

As you type your answer, the computer will display a rendering of it into "real" human math notation so that you can see how your input is being interpreted. If you're using this feature in a browser such as Internet Explorer that has poor math support, it will be slow, especially the first time you use it on a particular computer.

**academic honesty
policy**

In cases of serious academic dishonesty, I will assign a zero on the work, and I will also pursue action at the college level, which may result in penalties such as suspension or expulsion.

Serious academic dishonesty includes cheating on an exam, or turning in homework that is plagiarized from my solutions or from a source such as Chegg.

I will also assign a zero in cases where two students turn in homework or lab reports that contain identical or nearly identical work. A good rule of thumb is that if A is helping B, only B's paper should be out, and the pen should be in B's hand.

labs

Most labs have prelab questions, which you're expected to turn in on a piece of paper (not in a lab notebook) at the beginning of lab.

At the end of the first lab in the lab manual, there is information about the organization of labs.

If you miss a lab, you can only make it up in one of my other lab classes over the rest of the week, and it is still due at the same time it's due for everyone else. If you want to make up a lab, email me, and I'll coordinate with the physics

technician.

drops I will drop you under any of the following conditions:

- You miss any lab or lecture during the first two weeks without contacting me in advance by e-mail. If I don't receive any written work from you, I will consider that the same as an absence on that day.
- You don't turn in two consecutive homework assignments during the first two weeks. You don't need to get any problems right in order to fulfill this requirement, but you do need to show some attempt at a solution for at least some problems on each assignment. It's not enough to write "I don't know how to do this problem," but it is enough if you write, "I tried to do this problem using the equation $v^2 = 2ax$, but that didn't work because I couldn't figure out how to get x ."
- You miss an exam without contacting me in advance by e-mail.
- Over a period of seven consecutive days, you don't turn in any homework papers or quizzes, and don't complete all the lab work (participating in lab, and turning in written lab work when it's due).

Schedule for Physics 210, fall 2019 (evening)

		read ch.	hw	topics	lab
Aug.27	Tu			Velocity and relative motion.	1 interactions
	Th	2*	1*		
Sep. 3	Tu	0,3	2	Acceleration and free fall. Problem solving.	
	Th	1	3		
10	Tu	4	4	Force and motion.	2 the local gravitational field
	Th		5	<i>exam 1</i> †	
17	Tu	5	6	Analysis of forces.	3 Newton's second law
	Th	6	7	Newton's laws in three dimensions.	
24	Tu	7.1-3	8	Vectors.	4 vector addition of forces
	Th		9		
Oct. 1	Tu	8	10	Vectors and motion.	5 accel. in 2 dimensions
	Th		11		
8	Tu	9	12	Circular motion.	problem solving
	Th	10	13	Gravity.	
15	Tu		14	Physics 210 meeting. Hw due 11:45.	6 conservation laws
	Th		15		
22	Tu	11	16	Conservation of energy. Problem solving.	<i>exam 2</i> †
	Th	12	17	The energy zoo.	
29	Tu	13	18	Work.	7 cons. of energy
	Th	14	19	Conservation of momentum.	
Nov. 5	Tu		20		8 cons. of momentum
	Th	15	21	Conservation of angular momentum	
12	Tu	17	22	Vibrations.	9 torque
	Th	18	23	Resonance.	
19	Tu		24	Physics 210 meeting. Hw due 11:45.	10 resonance
	Th	19§	25	Free waves.	
26	Tu		26		<i>exam 3</i> †
	Th			<i>Thanksgiving</i>	
Dec. 3	Tu	20	27	Bounded waves.	11 standing waves
	Th		28		
10	Tu		29	Physics 210 meeting. Hw due 11:45.	12 resonances of sound
	Th			<i>Exam 4</i> †	

§Also watch the video on consonance and dissonance linked to from the book's web page. This is a preview of material covered in ch. 20.

†Bring a bluebook. All exams are cumulative. Each exam will concentrate on the material that you haven't yet been tested on. The last date to add notes to your folder for use on an exam is the preceding lecture.

Make sure you're up to speed on the three essential mathematical skills described in the appendix immediately following ch. 20. You can use a dictionary on exams, but it has to be a printed dictionary, not an electronic one. Exam 1 covers ch. 0-3. Exam 2 is through ch. 9. Exam 3 is through ch. 17. Exam 4 covers everything. For the standardized test, bring one of the long, skinny scantrons. It covers Newton's laws, energy, and momentum, and is closed notes.

* Whenever reading is assigned, you should bring both copies of your notes to class. To get a printout of your individualized homework assignments, go to the class's web page at lightandmatter.com/area3phys205.html and click on the link that says "homework printout for Physics 210."

student learning outcomes I. Outcome: Upon successful completion of this course, the student will be able to compare mechanical models to real-world systems in the laboratory, test theory via experiments, and recognize and analyze deviations from idealized theoretical behavior.

Assessment: Laboratory experiments.

II. Outcome: Upon successful completion of this course, the student will be able to analyze physical situations using conservation of mass, energy, momentum, and angular momentum.

Assessment: Homework and exams.

III. Outcome: Upon successful completion of this course, the student will be able to determine the applicability and nonapplicability of equations in particular situations in mechanics, describe the approximations and limitations involved, and systematically evaluate the usefulness of various equations by making lists of known and unknown quantities.

Assessment: Homework and exams.

students with disabilities Fullerton College is committed to providing educational accommodations for students with disabilities upon the timely request by the student to the instructor. Verification of the disability must also be provided. The Disability Support Services office functions as a resource for students and faculty in the determination and provision of educational accommodations. (Faculty Resource Guide at <http://staffdev.fullcoll.edu/>)