Syllabus for Physics 120, spring 2015

Ben Crowell, Fullerton College

office hours My office hours are in room 415-P (not my office), M 9:30-10, Tu 9-10, Tu 4-5:30, W 9:30-10, Th 9-10, and Th 4:30-5:30.

web page `www.lightandmatter.com/area3phys120.html`
To e-mail me, go to the class's web page and click on the link that says "contact me."

required materials The texts are:

- Takeuchi, An Illustrated Guide to Relativity
- Stannard, Relativity: A Very Short Introduction
- Ostriker and Mitton, Heart of Darkness

You can use a dictionary on exams, but it has to be a printed dictionary, not an electronic one.

grading Grades will be determined as follows. Some point totals are approximate.

learning narratives	4 @ 50 points each	200
exposition	1 @ 100 points	100
reading quizzes	40 questions @ 2 points each	80
exams	4 @ 120 points each	480
attendance	28 meetings @ 0-3 points each	84
participation	4 modules @ 0-20 points each	80

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

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.

learning narratives A learning narrative is a 1-2 page writing assignment in which you discuss a concept in the course that you initially didn't initially understand, relate your later insight into why you didn't understand it, and give a discussion that a future student could read in order to help them.

The class is divided into four modules, and you are required to write up a narrative that has to do with some aspect of the material covered in each module. I encourage you to do a narrative as soon as you encounter and overcome a difficulty with a particular module. Narratives will be graded on a scale of 0-50 points, with extra credit as follows depending on when they are turned in: 10 extra points if turned in by the 6th meeting of a module, 5 if by the first meeting of the next module. No credit will be given for narratives on modules I-III that are turned in after the 2nd meeting of the following module, and your narrative on module IV is due at the final exam.

exposition of a test of relativity This assignment is a 10-minute presentation to the class in which you give a detailed explanation of an experimental or observational test that supports or disproves one of the scientific theories presented in the course. Textbooks and lectures usually present simplified schematic versions of experiments, including a fairy-tale version of the history. Your exposition should give the uncensored, real-world story, based on internet research. This is where the class gets to hear about the pigeon poop that plagued Penzias and Wilson's microwave antenna, or about how Michelson and Morley obstinately refused to interpret their experiment as an anomaly, and instead carried out decades of follow-up experiments to fix their "wrong" result.

I will allocate a certain number of expositions to each of the four modules and give them out on a first-come, first-served basis to students who come up with a good topic and make steady progress in researching it. If many students procrastinate, there may not be enough spots available near the end of the semester.

Schedule for Physics 120, spring 2015

		read	topics
Module I: space and time			
Jan.26	M		Inertia
	W	Takeuchi, ch. 1-2	Frames of reference
Feb. 2	M	Takeuchi, ch. 3	The Galilean transformation
	W	Takeuchi, ch. 4	Relativity of time
9	M	Takeuchi, ch. 5	The universal speed c
	W	Takeuchi, ch. 6-7	The Lorentz transformation
16	M		*Presidents' Day*
	W	Stannard, pp. 1-32	Time dilation and length contraction
23	M		Causality
	W		Measurement
Mar. 2	M		
	W		*exam 1*†
Module II: matter and $E = mc^2$			
9	M		Newton's laws; mass
	W		Momentum; energy; light
16	M		$E = mc^2$
	W		Energy-momentum vector
23	M		
	W		*exam 2*†
Module III: gravity			
Apr. 6	M	Stannard, pp. 43-49	The equivalence principle.
	W	Stannard, pp. 49-79	Curved spacetime.
13	M		Matter.
	W	Stannard, pp. 79-95	Black holes.
20	M		
	W	Stannard, pp. 95-99	Gravitational waves.
27	M		
	W		*exam 3*†
Module IV: the big bang			
May 4	M	Ostriker, prologue and ch. 1	
	W	Ostriker, ch. 2-3	
11	M	Ostriker, ch. 4-5	
	W	Ostriker, ch. 6-7	
18	M		
	W		*exam 4*†

†Bring a bluebook. All exams are cumulative. Each exam will concentrate on the material that you haven't yet been tested on.