Syllabus for Physics 1C: Waves, Optics, and Modern Physics
UC San Diego, Summer 2015

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Class times: Mon., Tues., Wed., and Thurs. at 9:30-10:50 in Peterson Hall 102
Problem Sessions: Wednesdays at 11:00am-12:50pm, Center Hall 222
Course website: ted.ucsd.edu
Assignment website: www.webassign.net (class key: "ucsd 1146 4985")

The Physics Tutorial Center (tutorialcenter.ucsd.edu) will be open at 1-5pm on Monday through Friday and is located at 2702 Mayer Hall Addition.

Prerequisites:
• Physics 1A and 1AL, Physics 1B and 1BL
• concurrent enrollment in Physics 1CL
• calculus and trigonometry: Math 10C or 11 or 20C
I strongly suggest working through the attached math problems to remind yourself about derivatives, integrals, trig functions, etc., which we will use throughout the course.

Required supplies:
• Textbook: *Principles of Physics*, 5th edition, by Serway & Jewett
• i>clicker student response system remote
• scientific calculator
• 5 scantron sheets, form X101864-PAR, available at the bookstore
• No. 2 pencils for taking quizzes and the final exam

A scientific calculator—one that can perform trig functions and square roots—will be required in this course and should be brought to class daily and to every quiz and exam. On exams, devices that have calculator features but can communicate with other devices or with the Internet may not be used.
Laptops and tablets (like iPads) may *not* be used during class. All cell phones must be turned off prior to the beginning of class. Take notes with pen/pencil and paper, but don't copy the lecture slides as I will make them available to you online. The Ted website will be ready soon; until then, see http://cass.ucsd.edu/~rskibba/work/Teaching.html

Important Dates:
- Weekly quizzes will be on Mondays during the first half of class: July 6, July 13, July 20, July 27
- Two sets of homework assignments are due at the beginning of class on Wednesday (9:30) and at 5pm on Friday each week
- Final review of course material on the last class (Thursday, 30th July)
- Extra credit assignment due by 9:30 on the last class by email or in paper form
- Final exam will be on 31st July

Students must take their quizzes exams in their enrolled Phys 1C section. Any conflicts with a quiz or exam date must be discussed with the instructor *as soon as possible*. Make up exams are generally not available. You are responsible to comply with any applicable deadlines for adding or dropping the course.

Class calendar:
In general, we'll try to cover approximately two chapters of the textbook each week, in the following order:
- Oscillatory Motion (ch. 12)
- Mechanical Waves (ch. 13)
- Superposition and Standing Waves (ch. 14)
- Wave Optics (ch. 27)
- Reflection and Refraction of Light (ch. 25)
- Image Formation by Mirrors and Lenses (ch. 26)
- Quantum Physics (ch. 28)
- Atomic Physics (ch. 29)
- Nuclear Physics (ch. 30)
- Particle Physics (ch. 31), time permitting

Grades will be based on:
- Class participation: clickers + required HW problems & reading quizzes (10%)
- Weekly quizzes (60% total)
- Final exam (30%)
- Extra credit (0-5%)

Class Participation:
We will utilize "clickers" during the lectures as a means of promoting class participation. In this class, the i>clicker Student Response System will be used to foster discussion and promote learning throughout the course. The i>clicker remote can be purchased from the UCSD bookstore. Graded use of the clickers will begin once the Ted site is up and you have registered your clickers—which probably means on the first Wednesday class. But we will begin to use them immediately. Bringing multiple clickers to class will result in the clickers being confiscated and will be regarded as cheating (see "Academic Integrity" below). In order to receive credit, you must register your clicker using the "Register your clicker" tool on `ted.ucsd.edu`, the course website.

The total participation grade at the end of the course will be based on a combination of the following three things: your attendance and *participation during each class with*

clickers, your score in the *reading quizzes*, and your completion of the required *homework problems*. With this grading scheme, we are emphasizing the combination of being prepared for the lectures and actively participating in them to maximize your learning opportunities.

Homework assignments:
This class will include a free trial usage of **WebAssign**, which is an online homework submission tool. When you bought your textbook from the campus bookstore, WebAssign access was bundled with it, but I will ensure that those of you without a code will have free access for the duration of the course. Self-enroll on www.webassign.net with our class key (ucsd 1146 4985). The assignments called "homework problems" and "reading quiz" must be completed and count for a portion of your participation grade. To allow you time to enroll and become familiar with the site, the Chapter 12 assignments will not be required for your grade.

Because this is a compressed class and because we will cover considerable material over only five weeks, we will have *two* sets of homeworks due on WebAssign every week, and they will usually focus on a single chapter. The first homework is due on Wednesday at the beginning of class (9:30) and the second homework is due on Friday at 5pm every week. Late homework will not be counted.

I will assign additional "suggested problems" that will *not* be counted for your grade, but I *strongly* **strongly** recommend that you spend the time to work through them each week, either by yourself or in study groups. Everything in this course builds on previous material, and you will learn more, enjoy the course more, and perform better on the tests if you keep up each week by reading the text and solving the problems.

Quizzes and the Final Exam:
We will have four multiple-choice quizzes, taking place every Monday during the first half of class. (The first quiz will be on 6 July.) Quizzes cannot be taken late *for any reason*, and if you miss one, you have lost 15% of your grade. The quizzes and final exam **constitute the majority of your grade**, and you should make sure that you are prepared for them.

The quizzes will be based on the assigned reading, lectures, and homework assignments, and you can expect some of the problems and questions to be similar to the ones we cover in class, in the problem sessions, and in the assignments.

On the last class, we will have a final review of the course's material and go over any questions and concepts you are unsure about. The final exam will take place on 31 July, and it will be a three-hour, cumulative exam that will cover topics covered throughout the entire course.

Extra Credit:
If you have time, you may write one statement about physics applications or news related to material we've covered throughout the course. Examples: telescopes or microscopes with mirrors, fusion energy research, technologies or medical devices with lasers, carbon dating, LED lights, quantum computing, etc. (Look at the "Contexts" in

the book for other examples, but think about how the material applies to things you are interested in.) You must turn it in by the end of the course, due 30 July at 9:30am by email or in paper at class for a maximum of +5%. Typical scores probably will be in the +2-4% range though.

Make sure to cite any sources you use, such as a website's URL or a book or article reference. Be careful so that you do not plagiarize or copy anything from another student, magazine, journal, newspaper, or website; plagiarism is considered cheating (see "Academic Integrity") and plagiarized work is much *much* worse than doing no extra credit at all. Reading multiple sources with different information and perspectives may help you to write the statement. Think of these as short papers, approximately 3-4 pages double-spaced. Show me that you have thought about and learned about how people utilize a physics concept in a particular application, or focus on a recent discovery.

About the class:
Physics 1C is the third quarter of a three-quarter introductory physics sequence geared toward students majoring in the life sciences. This course will focus on waves and the interaction of light and matter as described with optics and quantum mechanics. The course will be very challenging though, and it will be even tougher since it is compressed into only five weeks. You should only be taking it if you are ready to work hard throughout every week.

Physics and astrophysics are really awesome! This course will include lots of interesting material. We'll start with harmonic oscillations and wave interference, which are really fundamental stuff, then we'll wave optics, reflection, and refraction, which also have numerous applications. Then we're in for a treat at the end of the quarter when we get to quantum mechanics, nuclear physics, and particle physics. Scientists still debate about many of these topics today, and it will be great to explore them together.

More importantly, throughout the class, I hope you learn about the diversity of scientists in history and today, about how the scientific process works, and about how science helps one to think critically. Moreover, life science, social science, and physical science fields are connected with each other and have myriad applications in everyday life, sometimes in unexpected waves. When scientists first studied the subjects in this physics course, they couldn't have predicted that they'd be relevant to satellite technology, GPS, fiber optics and other internet infrastructure, solar panels, and nuclear power and fusion research, to give a few examples.

About the instructor:
I (Ramin Skibba) am a research scientist at the Center for Astrophysics & Space Sciences at UC San Diego. I went to Notre Dame as an undergrad and studied physics and philosophy. I earned my Ph.D in physics and astronomy at the University of Pittsburgh, and then I was a postdoctoral researcher at the Max Planck Institute for Astronomy in Heidelberg, Germany and at the University of Arizona, before coming to San Diego. I work on theoretical and observational astrophysics with a focus on galaxy

formation, dark matter, cosmology, and the structure of the universe. My work website is here: `http://cass.ucsd.edu/~rskibba/`
and I also write about astrophysics news and science policy on my blog, *Science Political*: `http:\\`<u>`raminskibba.net`</u>

Academic Integrity:
Just as we expect professional scientists and doctors to work with integrity, we expect students to complete their courses with integrity as well. Academic dishonesty will not be tolerated in this class. All efforts that lead to grades in this course must be the sole work product of the student. Examples of academic misconduct include the use of multiple clickers, plagiarism of extra credit assignments, or online submission of someone else's work as your own. Any student found guilty of academic dishonesty, no matter the magnitude of the infraction, may receive a failing grade for the course. Cheating, plagiarism, and other forms of academic misconduct will be handled pursuant to the UCSD Policy on Integrity of Scholarship that can be found in the UCSD general catalog.

A Few Practice Math Problems

Take the derivative of the following expressions with respect to t:

1. $\cos(at)$
2. $\exp(at)$
3. $x + vt + (1/2)at^2$

Integrate the following with respect to t:

1. $\cos(t)$
2. $\exp(t)$
3. $v + at$

Draw sine(x) and cosine(x) from $x=0$ to 2π: