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

Instructor: **Ramin Skibba**
email: rskibba@ucsd.edu
office: SERF 429
office hours: Mondays at 3:00-5:00pm

TA: Bili Dong
email: b2dong@ucsd.edu
office hours: Tuesdays & Thursdays at 1-2pm, SERF 465

Class times: Monday, Wednesday, Friday at 1:00-1:50pm, York Hall 2622
Problem Sessions: Thursdays at 8:00-9:50pm, Center Hall 105
Course website: ted.ucsd.edu
Assignment website: www.webassign.net

The Physics Tutorial Center (tutorialcenter.ucsd.edu) will be open at 3-8pm on Sunday through Thursday 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
• 6 scantrons, form X101864-PAR, available at the bookstore
• No. 2 pencils for taking tests

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 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 or pencil and paper, but don't copy the lecture slides as I will make them available to you online.

Important Dates:
- Biweekly exams will be on Fridays, except for the last one: April 10, April 24, May 8, May 22, and June 3.
- Final review of course material on the last class: Friday, 5th June
- Monday, 25th May is a holiday (Memorial Day).
- Final exam will be between 6 and 12th June.
- Commencement will be on the following weekend (13-14 June).

Students must take their exams in their enrolled Phys 1C section. Any conflicts with an exam date must be discussed with the instructor *as soon as possible*. Make up exams are 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 a chapter 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)

Grades will be based on:
- Class participation: clickers + required HW problems + reading quizzes (10%)
- Biweekly exams (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 on Monday, 6 April, 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 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. I'll assign a few HW problems with WebAssign which must be completed before Friday class (at 1pm) every week to count as part of your participation grade. Reading quizzes also will be due on Fridays.

I will assign additional problems and questions 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 exams if you keep up each week by reading the text and solving the problems.

Exams:
We will have five multiple-choice exams, taking place in class every other Friday, except for the last one. (The first one will be on the 10th of April.) Exams cannot be taken late *for any reason*, but if you somehow must miss one, please let me know ASAP. Note that **the biweekly exams constitute the majority of your grade**, and you should make sure that you are prepared for them.

The exams will be based on the assigned reading, lectures, and homework assignments, and you can expect the problems and questions to be similar to the ones we cover in class, in the PBs, and in the assignments.

On the last class (on the 5th of June) we will have a final review of the course's material and go over questions and concepts you are unsure about. The final exam will take place during the following week, 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 up to two statements 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, 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 may turn at most one statement by the end of each half of the course, due 1st May and 5th June, and you may earn 0-2.5% each (for a total of +5% max).

Cite any sources you use, such as a website's URL. 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. These should be concise statements, not essays, between 1-2 pages long. Show me that you have learned how people utilize these physics concepts to a particular application.

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.

Physics and astrophysics are really awesome! This course will be challenging and 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:
`http:\\raminskibba.net`

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 0 to 2π: