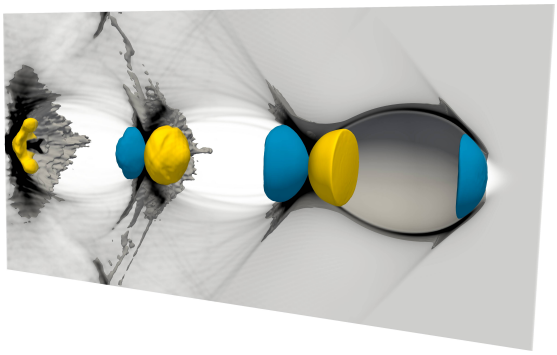
SYLLABUS: Physics 1C
Physics for Scientists and Engineers
Electrodynamics, Optics, and Special Relativity
Spring 2023



Instructor	Brian Naranjo (naranjo@physics.ucla.edu)
TAs	Tim Wilson (timw@ucla.edu)
	Jiasheng He (jshhe@g.ucla.edu)
Course administrator	Mary Tran (mtran@physics.ucla.edu)
Lectures	TR 10-11:50AM, Kinsey Pavilion 1240B
Discussion sections	1A: W 10-10:50AM, Dodd 167
	1B: W 3-3:50PM, Boelter 5264
	1C: W 4-4:50PM, PAB 2434
	1D: F 8-8:50AM, PAB 2748
	1E: F 10-10:50AM, PAB 2748
Instructor's office hours	TR 7-8AM, TR 1:30-3:20PM, or by appt., Knudsen 3-168
Final	Tuesday, June 13, 11:30AM-2:30PM, Location TBA
Required textbook	Young and Freedman, *University Physics with Modern Physics* (15th ed., 2019)
Good textbooks	Halliday and Resnick, *Physics* (3rd ed., 1977)
	Orear, *Physics* (1979)
	Taylor and Wheeler, *Spacetime Physics* (1st ed., 1966)
Requisites	Physics 1A-1B, and Math 32A-32B are prerequisites, and Math 33A is a corequisite
Topics	Magnetic fields, Ampère's law, Faraday's law, inductance, alternating current circuits, Maxwell's equations, electromagnetic waves, light, geometrical optics, interference, diffraction, and special relativity.

[1]The figure above shows a plasma wakefield accelerator (PWFA) operating in the *blowout regime*, originally conceived and developed at UCLA. An ultrarelativistic *driver pulse* of electrons, in the blue region on the right, plows through a preionized plasma, driving out the plasma's electrons, leaving behind a sequence of positively-charged bubbles. A second *witness bunch* of electrons is injected into the first yellow region, where it experiences acceleration gradients orders-of-magnitude beyond what is obtainable in a conventional accelerator. This fully 3D simulation of the relativistic charged-particle electrodynamics, with nearly half a billion macroparticles, was carried out on an 80GB nVidia A100 GPU.

Tentative schedule

Week	Topic	Tuesday	Thursday	Reading
01	Magnetostatics	L01	L02	27, 28
02	Induction	L03	L04	29.1-29.6, 30.1-30.3
03	AC circuits	L05	L06	30.4-30.6, 31
04	MT1 review	L07	**MT1**	No new reading or homework
05	Electromagnetic waves	L08	L09	29.7 (previously skipped), 32, 33.1-33.6
06	Geometric optics	L10	L11	34 (skim 34.4-34.8)
07	Interference	L12	L13	35
08	MT2 review	L14	**MT2**	No new reading or homework
09	Diffraction	L15	L16	33.7 (previously skipped), 36
10	Special relativity	L17	L18	37

- Mastering Physics assignments are due Saturdays at 11:59 PM.
- Problem sets are due Mondays at 11:59 PM. Submit via Gradescope.
- **MT1** (chapters 27-31) Thursday, April 27, 10AM-11:50AM, Kinsey Pavilion 1240B
- **MT2** (chapters 32-35) Thursday, May 25, 10AM-11:50AM, Kinsey Pavilion 1240B
- **Final** (cumulative) Tuesday, June 13, 11:30AM-2:30PM, Location TBA

Grading scheme

- Grades are weighted according to:

Mastering Physics	5%
Problem sets	10%
First midterm	25%
Second midterm	25%
Final	35%

- Problem sets and exams are scored on the following hundred-point scale:

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
$[100, 97]$	(97,93]	(93,90]	(90,87]	(87,83]	(83,80]	(80,77]	(77,73]	(73,70]	(70,67]	(67,63]	(63,60]	< 60

- Your course letter grade is determined using the same hundred-point scale, with no rounding.
- Your overall Mastering Physics score is given by the cumulative percentage of points earned during the quarter. You have unlimited attempts with no loss of credit for incorrect answers.
- Your overall problem set score is given by the average of the seven equally-weighted problem set scores.

- Each of the three exams is curved separately. As a rough guideline, typically 30% of the exams will be in the A range, 30% will be in the B range, 30% will be in the C range, and the remaining 10% will be Ds and Fs. I try to write exams that yield a broad distribution of scores, and I will only curve scores toward higher grades.

Homework policy

- Discussing homework with classmates is encouraged.
- Using Mathematica, Maple, SymPy, etc. to check algebra is fine and a good skill.
- Using LaTeXfor problem sets is fine. Making an excellent write-up (good diagrams, good verbal description, concise, insightful, etc.) will help solidify your understanding.
- No matter what assistance or guidance (e.g., from the instructor, a TA, a classmate, a solution manual, an AI chatbot, other textbooks, etc.) that you received in your understanding of a problem, your actual write-up must be your own work. If you can't write your solution on a blank sheet of paper without using references, then you are ready for neither your write-up nor your exam.
- Please don't post my problems on Chegg. Just ask me for help.
- Problems sets are graded for completeness.
- No late homework, either Mastering Physics or problem sets, will be accepted without an extension granted *prior* to the due date.

Exam policy

- Format of exam questions is similar to that of the problem sets.
- Calculators are not needed and are not permitted during exams.
- Exams are closed-book with no outside notes permitted.

Lecture

- Lecture and discussion attendance, while strongly encouraged, is not strictly mandatory.
- During lectures, I will write out notes on a tablet, whose display is projected onto the large screen in the lecture hall. To those who really must miss a lecture, I provide both these handwritten notes and my corresponding typeset notes on BruinLearn. Please keep in mind that a student's class attendance is known to have an extremely high positive correlation with their resulting grade.[2]
- After lectures conclude, I will remain as long as there are questions, at least until the next instructor arrives for his 12:30 PM class. Feel free to discuss the lecture material or homework.

[2]M. Credè, S. Roch, and U. Kieszczynka, "Class attendance in college: A meta-analytic review of the relationship of class attendance with grades and student characteristics." *Rev. Educ. Res.* **80** (2010) 272

Campuswire

We will be using Campuswire for class discussion. Outside of office hours, this is the fastest and most efficient way to get help from classmates, the TAs, and myself. Rather than emailing questions to the teaching staff, you are encouraged to post your questions on Campuswire. Full anonymity is enabled, so you may choose to post anonymously. The join link and code are available on BruinLearn.

Textbook

This course is part of the UCLA Inclusive Access program. Your course materials are being automatically provided to you, digitally, through BruinLearn before the first day of class or upon enrollment. You will receive e-mail from the UCLA Store with program details and cost sent directly to your email address on file with the UCLA Registrar. It is your responsibility to read all communication coming from the bookstore. Check your spam folder if not received.

Mastering Physics, a component of this course, is only available through Inclusive Access, so do not choose to opt out. Any questions regarding the Inclusive Access program can be directed to inclusiveaccess@asucla.ucla.edu.