UC BERKELEY Department of Physics

PHYS 7A-001: Physics for Scientists and Engineers

Fall/2021 Ahmet Yildiz

Contact/Office Hours

Instructor: Ahmet Yildiz, yildiz@berkeley.edu

Office hours: Tuesday 4-5 and Friday 2-3, 474 Stanley Hall

I will teach the physical concepts and the course material, and solve problems in lectures and during my office hours, after the lectures, or through emails. My purpose is not only to teach you mechanics but also to help you think critically, acquire a logical thought process, and focus on the concepts more than applying some recipes. As students, it is crucial to realize that your academic performance is enhanced if you cultivate the following mindset: curiosity, desire to learn, tenacity and interactions with your peers.

Head GSI: Newton Cheng, newtoncheng@berkeley.edu, Office hours: To be announced

All administrative issues (e.g. switching sections, dropping the class, adding the class, missing labs, missing exams due to serious health issues, Mastering Physics conflicts…) have to be addressed directly to the head GSI.

I WILL NOT be able to help you resolve these issues. If you happen to e-mail me such requests by mistake, **I MAY** forward them to the head GSI.

Important notes

The lecture portion of this course will be taught remotely this semester. Lectures will be delivered synchronously to encourage students' participation, but attendance is not mandatory in order to provide more flexibility.

Please note that all dates and times in this document (and for the class as a whole) are listed in Pacific time. If you are in a different time zone it is your responsibility to ensure that you properly convert each time to your local one. Furthermore, please note that CA follows daylight savings time changes. This means that, after November 7, the conversion to your local time zone may change.

First two weeks: The early-drop deadline still holds, so you must attend ALL your discussion/laboratory (DIS/LAB) sections during the first two weeks of class to remain enrolled, including those scheduled before the first lecture. If, on the contrary, you want to drop the class, it is YOUR responsibility to do it before the drop deadline, otherwise you will have to complete the course. The Drop Deadline is Friday 9/3. Please contact Anna Hilke <ahilke@berkeley.edu> in Student Services (368 LeConte) for more detailed enrollment information.

Course website

Once you are registered in the class, you should have access to the course website on bCourses (**https://bcourses.berkeley.edu/courses/1508312**). The site will contain all course information throughout the semester. I will upload syllabus, announcements, lecture slides, old exams, exam solutions, grade distributions... to this website. Make sure your email address is correct as all course communications will be distributed through bCourses mailings. It is your responsibility to check for announcements regularly in order to ensure that you do not miss any important information.

7A Course Center: 105 LeConte Hall
Additional help is available through the Student Learning Center (Golden Bear Center), the Honors Society, the Society of Physics Students, and the Physics Scholars Program. Inquire in the Physics Department Undergraduate Student Services Office (368 LeConte Hall) for further information. The course center is designed to facilitate group work. It will be open during business hours whether or not office hours are being held, so feel free to come to work individually or in groups any time.

Attendance Policy
Your attendance and active participation in all parts of the course is expected. Attendance will not be graded. You are responsible for all information presented in lectures, D/L sections and HW assignments.

Assignments/Grading Procedures
Grades will be determined from a weighting of all the elements as follows:

- Labs 10%
- Homework 10%
- Midterm 1 22.5%
- Midterm 2 22.5%
- Final Exam 35%

Your numerical score will be used to assign a course letter grade for the class, with two exceptions discussed below. The mapping of ranges of numerical scores to letter grades (A,B,C,D,F) will reflect our judgment as to what percentages correspond to various degrees of demonstrated performance and learning, based on our overall assessment of all assignments, their difficulty, and their weights.

When taking a class pass/no-pass (P/NP), a *P* grade corresponds to the equivalent of a *C-* grade or above. Out of the desire to maintain the high standards for education at the University of California, and fairness and meaningfulness of grades, the University and Physics Department have established "strongly recommended" guidelines for the distribution of A's, B's, and C's in any one course. For lower-division, non-honors courses like Physics 8B, the recommendations are as follows: 25% A+/A/A-, 40% B+/B/B-, and 35% C+ or below. D's and F's will be given on a case-by-case basis to students displaying especially poor performance. Note that the letter grade will only be assigned at the very end of the semester, after calculating the weighted average.

A course grade of "Incomplete" will only be considered under circumstances beyond a student's control, and only when these circumstances have prevented the student from completing certain assignments – not just because performance suffered – and then, according to official university policy, only when work already completed is of at least "C" quality or better.

Class Start Time
This class follows "Berkeley Time" so lecture starts promptly at 1:10pm.

Required materials and readings
• Textbook: Giancoli, Physics for Scientists & Engineers, Volume 1 (Custom Edition for UC Berkeley)
• Lab manual/Workbook: Physics 7A Student Workbook, Birkett & Elby
• Homework software: Mastering Physics (course code: **yildiz83352**)

Reading the textbook and working problems is very important. Be prepared for lecture and section by reading the assigned material in advance. Lectures and sections both assume that some of the basic material has been learned from the text already.

Suggested course material:

- Kleppner and Kolenkow, An Introduction to Mechanics, 2nd edition

This book contains lots of challenging problems at the exam level. I recommend going through these problems AFTER finishing the challenge problems in Giancoli.

Prerequisites:

- Math 1A (Calculus) is a prerequisite
- Math 1B may be taken concurrently

Math proficiency in the following areas is essential: algebra, trigonometry, single-variable differentiation, derivation, integration, and **vector algebra** (both dot product and cross product). If you are uncertain about your preparation, consult the head GSI.

Lectures

Lectures will be delivered synchronously via Zoom using the link provided on bCourses at the officially scheduled lecture time (starting at Berkeley time). You are encouraged to attend; however, considering that not everyone has the same learning style and some of you will be taking the class remotely, the lectures will be recorded and posted to bCourses. If you are not able to attend lecture in real time but have questions, you are strongly encouraged to ask questions in office hours which will be held by your lecturer as well as all the GSIs.

Lectures are meant to present the course material but that doesn't mean that you should be passively taking notes without thinking. I therefore recommend that you to read the material beforehand, and I encourage you to ask questions during lectures! Because of the amount of material that needs to be covered, the number of examples covered in lecture will be limited, so discussion/lab meetings and homework are essential to your understanding of the material.

- Physics 7A will cover Newtonian Mechanics, Fluids, and Waves.
- We have 16 chapters to cover in 15 weeks (including holidays). This is a lot of material and **we have to move fast**. It is very easy to fall behind. Please try to keep up with the material and let us know if we move way too fast! We will cover the first three chapters quickly and slow down to the usual pace of the course in Newtonian Mechanics.
- We will cover the material at a high level.
- **We assume that you have seen this material at a simpler level in high school.**
- If you are familiar with the material, you may enjoy this course. What if this is not the case?

"*It is very frustrating that this course operates under the assumption that students have taken a physics class prior to taking this one. Many of us did not have access to a physics class in our high school, so it makes it much more difficult to keep up with the content that is difficult even for students who have taken physics classes before. This assumption alienates students from under–resourced communities and puts them at a disadvantage from the start.*"

An anonymous student who took this course from me several years ago

If you have not taken Physics before, you may find it very difficult to catch up with the pace of the course. This course offers many ways to learn the material through lectures, lecture demos, after-class discussions, office hours, GSI discussion/problem-solving sections (Workbook problems), labs, homeworks (Mastering Physics, online). I strongly recommend:

- Before each lecture, read the relevant Chapter in the book and go through the lecture slides
- Attend the lectures
- Ask questions after lectures
- After lectures, try to solve the examples solved in lectures yourself
- Attend Office Hours
- Attend Discussion Sections and GSI office hours
- Spend extra time on problem-solving
- Group study
- 10-15 hours of work per week
- If you fall behind, the course is not going to wait for you.
- If you do not attend the lectures and try to go over the lecture material a few days before the exam, don't be surprised if you get abysmal exam scores.

Discussion/Laboratory (D/L) Sections

You must be registered in DIS and LAB sections with the same number (e.g. DIS 203 & LAB 203). Some D/L meetings will be discussions, and some will be laboratory sessions; but the sections always meet twice a week for two hours. The lab schedule is shown on the syllabus. You must attend ALL your registered discussion sections during the first 2 weeks or you may be dropped from the course. If you wish to change discussion sections, you have to make an official change through CalCentral. If you cannot find any available spot, you can seek someone in the class with whom to switch by going to the "Discussions" on bCourses. Put your request in the subject line – "From Section 1xx to Section 1yy", (state the sections you wish to swap) and your email address. If you find a match, coordinate so each of you simultaneously drops your D/L section on CalCentral and immediately signs up for the other one.

If you are in one of the remote discussion/lab sections, they will be held synchronously via Zoom at the officially scheduled time. The Zoom link and all other necessary details will be provided by your own GSI. However, for those of you living far away, the GSIs will post some recordings of the discussions (when they provide explanations/reminders to the entire group) as well as the experimental part of the labs (data collection).

- Discussion and lab (D/L) sections begin on the first day of instruction.
- DL sections meet twice a week for two hours EVERY week, even when there is no lab scheduled.
- In your DL sections, you will practice problems and discuss concepts in small groups, with the guidance of a GSI, as well as perform labs. Attending D/L sections plays a huge part in your understanding of the material, as sections provide an opportunity to work in smaller groups, ask more/deeper questions, discuss areas you are uncertain of, and improve your problem-solving and writing skills. You are responsible for the material presented in DIS/LAB sections.
- You must bring your workbook to your DL section.
- There will be 7 labs throughout the semester (see the syllabus) performed in your DL section. While you perform the labs, you will complete the lab worksheet found in the workbook. You will turn in the lab worksheet at the end of your lab section.
- If you miss a lab for a valid reason (e.g. illness) you must email your GSI to let them know the reason for your absence. To make up a missed lab, you should attend another DL section during that same week, also emailing that GSI ahead of time to let them know you will be attending their

section. If you are not able to make up a lab in the week that it runs, one lab setup will also be available in each lab room the following week for makeup. You may only make up a lab in the following week once per semester. After that following week, you will not be able to make up the lab at all.

- You are required to complete ALL labs: any uncompleted labs will result in a reduction of your grade by 1/3 of a letter grade for each lab missed. If you miss more than one lab, you will fail this course.
- If you miss a lab for a valid reason (e.g. illness) you must email your GSI to let them know the reason for your absence. To make up a missed lab, you should attend another DL section during that same week, also emailing that GSI ahead of time to let them know you will be attending their section. If you are not able to make up a lab in the week that it runs, one lab setup will also be available in each lab room the following week for makeup. You may only make up a lab in the following week once per semester. After that following week, you will not be able to make up the lab at all. There will be no make-ups at the end of the semester.

Homework

- There will be weekly homework due Fridays at 11 pm. They will be due on a weekly basis to help you review the material covered in class during the previous week.
- Homework will be computer-based homework on the Mastering Physics website.
- You must purchase a registration card either along with your textbook or on the Mastering Physics website (www.masteringphysics.com) directly.
- You will need to sign up for Mastering Physics with your Cal SID# and use the Course ID: **yildiz83352**. If your Cal SID # is incorrect you will not receive homework credit.
- Since my focus is more on the concepts than on numerical values, I will try to assign symbolic problems, as much as possible.
- No late homework will be accepted. We will drop your lowest **two** homework scores.
- We encourage you to work with and help other students. While other students may teach you how to do a problem, you must eventually be able to solve the problem on your own and submit your own solution, not one copied from another student. Working on homework problems is key to your in-depth understanding of the course material. For each HW problem, I encourage you to write down neat and detailed solutions in a notebook, working with symbols instead of numbers in a logical and organized manner, as expected on an exam.
- **Homework problems are typically easier than the midterm and final problems**. This is because homework is designed to have you practice the material every week, whereas the exams expect that you mastered the material after lots of practice.

PA Scholar Peer Tutors

This semester with the support of the Discover Departmental Innovation Award and the MPS Dean, the Student Learning Center (SLC) will provide group tutoring and homework help for all Physics 7 series courses. Our tutors have been vetted by the Physics department and are all successful UC Berkeley Physics undergraduates who have shown academic merit and a desire to serve the community. They are receiving training through the SLC to "leverage the power of peer collaboration to meet students where they are and support them in mastering their science coursework". The sessions hosted by our tutors are a great way for students to connect with each other and form a collaborative and supportive learning environment with the guidance of a peer.

This tutoring and homework help service is available to all students in this class free of charge and you

are encouraged to use it. We will post details of meeting times and locations on our course website. We highly encourage you to take advantage of this opportunity, especially if you are in need of homework help. Physics 7 study halls can be host to homework parties, study sessions, and more!

Exams
There will be 2 midterm examinations and a final examination on

Tues. Sept. 28, location 10 Evans and Hearst Field Annex 1, 7-9 pm

Tues. Nov. 2, location 145 Dwinelle and Hearst Field Annex 1, 7-9 pm

Tues. Dec. 14, location TBA, 8-11am

A Cal ID with your picture is required at all exams. More details regarding what you will be allowed to bring will be posted before each exam.

- Topic coverage of each exam will be announced a week before the exam in lectures and on the course website.
- **The final exam is not cumulative** and will focus on the last chapters, but you may be required to know the fundamentals of mechanics in order to solve those questions.
- You MUST be available to take all exams. Unresolvable conflicts with the exam dates must be discussed with the head GSI immediately.
- Exams will include conceptual questions and workbook-level questions, as well as quantitative problems. **The level of exam questions is higher** than practice problems at the beginning of the chapters in Giancoli and most of the homework problems. They are at the level of end of chapter problems with (*) or the ones in "General Problems". Problems in Kleppner and Kolenkow are better representative of the exam level.
- Questions and answers of **the old exams** are uploaded to the bcourses website. They are the most representative of the exam level.
- **Please write legibly.** Exam problems will be graded based on your solutions. Partial credit will be given even if you do not have the correct answer. No credit will be given for correct answers without a clear reasoning and showing your work.

Weekly Schedule
See the last page of this document

Links to University Services
In the event of personal issues affecting your academic performance or if you are falling behind, PLEASE talk to me (or Newton) as soon as possible.

There are many resources available to help you, so we strongly encourage you to take advantage of them. Also, keep in mind that working with your peers and providing explanations to other students is an excellent way of improving your understanding of the course material.

- Academic Calendar and Student Accommodations - Campus Policies and Guidelines http://teaching.berkeley.edu/academic-calendar-and-student-accommodations-campus-policies-and-guidelines Should an exam or deadline fall on a cultural or religious holiday, and you wish to seek an accommodation, please email the Head GSI with your name, and discussion/lab number with ample advance notice.

- Disabled Student Services http://dsp.berkeley.edu/ DSP serves currently enrolled UC Berkeley students with documented disabilities seeking undergraduate and graduate degrees. If you have a disability, or think you may have a disability, you can work with DSP to request an official accommodation. DSP is located at 260 César Chávez Student Center. Students may call 642-0518 (voice), 642-6376 (TTY), or e-mail dsp@berkelely.edu.
- Tang Center: Counseling and Psychological Services https://uhs.berkeley.edu/counseling CPS offers short term counseling for academic, career and personal issues. There is no charge to get started, and all registered students can access services regardless of their insurance plan. There is no charge to get started, and all registered students can access services regardless of their insurance plan.
- Path to Care http://sa.berkeley.edu/dean/confidential-care-advocate The PATH to Care Center provides affirming, empowering, and confidential support for survivors and those who have experienced gendered violence, including: sexual harassment, dating and intimate partner violence, sexual assault, stalking, and sexual exploitation. Confidential advocates bring a non-judgmental, caring approach to exploring all options, rights, and resources.
- Student Wellness Resources https://wellness.asuc.org/ A partial directory outlining campus services that may prove useful throughout a student's time, ranging from direct academic assistance to student health and wellness resources.
- The Basic Needs Center https://basicneeds.berkeley.edu/ provides support with all the essential resources (food, housing, etc.) needed to not only survive, but thrive here at UC Berkeley.
- Suggestions or comments about your courses, the department or your instructors can also be submitted anonymously via the Questions and Comments section of the physics departments' DE&I website:

https://physics.berkeley.edu/about-us/equity-inclusion/faq-on-sexual-harassment/submit-a-question

Statement of Commitment to Equity and Inclusion

- All individuals in the Department of Physics have the right to work and learn together in an environment free of harassment, exploitation, or intimidation. We seek to establish a classroom culture that nurtures the physics identity and remove barriers to entry in order to strengthen pathways into the field. Setting students on a path to envision themselves with a degree in physics and related STEM fields in greater numbers ensures more diverse graduating classes, more diverse graduate programs, and in turn has the potential to inspire a new generation of physicists. We strive to ensure these ideals are the core of our culture.
- Exams and assignments in this course are a diagnostic of your current skill levels, which can be improved with practice, and are not a measure of permanent ability. As a participant in this class, you can be proactive about making other students feel included and respected. We encourage you to approach your instructor or Student Services if:
- Your official records do not reflect your correct name and/or set of pronouns that you would like us to use.
- Your performance in the class is impacted by your experiences outside the class (e.g., family matters, current events); we would like to help you find resources to cope. See the Links to University Services below).
- Something was said in class (by anyone) that made you feel uncomfortable.

Academic Dishonesty
I strongly encourage you to work with your fellow students when appropriate, for example during DIS/LAB sections and when you do your HW. However, exams should reflect your own work and any form of cheating will be treated very severely, most likely by your failing the entire course and by referral to Student Judicial Affairs: http://students.berkeley.edu/uga/conduct.asp.

Land Acknowledgement
Native American Student Development recognizes that UC Berkeley sits on the territory of xučyun (Huichin), the ancestral and unceded land of the Chochenyo speaking Ohlone people, the successors of the sovereign Verona Band of Alameda County. This land was and continues to be of great importance to the Muwekma Ohlone Tribe and other familial descendants of the Verona Band.

We recognize that every member of the Berkeley community has, and continues to benefit from, the use and occupation of this land, since the institution's founding in 1868. Consistent with our values of community, inclusion and diversity, we have a responsibility to acknowledge and make visible the university's relationship to Native peoples. As members of the Berkeley community, it is vitally important that we not only recognize the history of the land on which we stand, but also, we recognize that the Muwekma Ohlone people are alive and flourishing members of the Berkeley and broader Bay Area communities today.

This acknowledgement was co-created with the Muwekma Ohlone Tribe and Native American Student Development and is a living document.

Visit UC Berkeley's website for the Centers for Educational Justice & Community Engagement at https://cejce.berkeley.edu/ohloneland for more information.

Non-Discrimination Statement
In accordance with applicable Federal and State law and University policy, the University of California, Berkeley, does not discriminate on the basis of race, color, national origin, religion, sex, gender identity, pregnancy, physical or mental disability, medical condition (cancer related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services. The University of California, Berkeley also prohibits sexual harassment. This nondiscrimination policy covers the following individuals: students, employees, applicants for admission and employment, access, and treatment in University programs and activities.

The federal and state laws and regulations prohibiting discrimination and harassment include the Americans with Disabilities Act (ADA), Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, Title VII of the Civil Rights Act of 1964 as Amended by the Equal Employment Opportunity Act of 1972, and the California State.

Weekly schedule:

Week	Chapters	Lectures	DL Sections	Online HW	Comments
Week 1 (8/25 - 8/27)	2	Couse Overview 1D Kinematics	Intro WS 1 Intro HW: 8/30	Introduction to MP	*First Day of Class: Tuesday, 1/16*
Week 2 (8/30 - 9/3)	3	2D Kinematics	WS 2 **Lab 1** HW1: 9/3	2: 7, 19, 27, 43, 63, 64, 65, 81, 84	**Drop Deadline, 9/3**
Week 3 (9/8 - 9/10)	4	Force Newton's Laws	WS 3 WS 4 **Lab 2** HW2: 9/10	3: 46, 80, 95, 97, +2 MP, 55, 70, 85	**Holiday 9/6**
Week 4 (9/13 - 9/17)	4 5	Friction Circular Motion *Material for Midterm 1 Ends Here*	WS 5 **Lab 3** HW3: 9/17	4: 16, 25, 32, 49, 26, 54, 56, 57, +1MP	
Week 5 (9/20 - 9/24)	7	The Work Energy Principle	WS 6 WS 7 HW4: 9/24	5:26,28,38,63,74, 31, 69,87	**Reviews (9/25, 9/26)**
Week 6 (9/27 - 10/1)	8	Conservation of Energy	WS 8 HW5: 10/1	7: 13, 49, 63, 69, 85, 90, +1MP	**Midterm I (9/27), 7-9 PM 10 Evans, Hearst Field Annex 1**
Week 7 (10/4 - 10/8)	6 8 9	Gravitation Gravitational Energy Linear Momentum	WS9 HW6: 10/8	7: 68, 73 8: 27, 28, 42, 44, 74, 93, 90	
Week 8 (10/11 - 10/15)	9	Linear Momentum Center of Mass Collisions	WS 18 HW7: 10/15	6: 26, 30, 78, 17,35,44, 74 8: 60,78	
Week 9 (10/18 - 10/22)	10	Rotational Kinematics Rotational Dynamics	WS 10 **Lab 4** HW8: 10/22	9: 13, 78, 20,33,108, 50, 99, 41, 107	
Week 10 (10/25 - 10/29)	11	Angular Momentum *Material for Midterm 2 Ends Here*	WS 11 WS 14 WS 15 **Lab 5** HW9: 10/29	10: 15, 46, 52, 59, 69, 81, 92, 99, 100	
Week 11 (11/1 - 11/5)	12 13	Statics Fluid Statics	WS 16 HW10: 11/5	11: 10, 17, 19, 40, 41, 46, 51, 68, 73	**Reviews (10/30, 10/31)** **Midterm II (11/1) 7-9 PM 145 Dwinelle, Hearst Field Annex 1**
Week 12 (11/8 - 11/12)	13 14	Fluid Dynamics Oscillations	WS 13 WS 20 HW11: 11/12	12: 22,30,69,73 13:20,38,80,42	
Week 13 (11/15 - 11/19)	14 15	Oscillations Wave Motion	WS 21 **Lab 6** HW12: 11/19	13: 58, 62, 96 14: 23,24,35,37	
Week 14 (11/22)	15	Wave Motion	WS 17		**Holiday 11/24 – 11/26**
Week 15 (11/29 - 12/3)	15 16	Wave Motion Sound *Course Ends*	WS 19 **Lab 7** HW13: 12/3	14: 55,62,90 15: 9,50,75, 52,56,78	*Last day of Class: Friday, 12/3*
12/6 - 12/10		RRR WEEK			
12/14, 8-11 AM		**FINAL EXAM**	**Group 5, Location TBD**		

Note: This syllabus is subject to minor changes based on progress. Please pay attention to any bcourses announcements online or in lectures.