Physics 4A – General Physics with Calculus

Course Description: Comprehensive study of major topics of physics: motion, forces, gravity, energy, momentum, rotation, equilibrium, fluids, oscillations, waves, and sound.
(AA/AS area 1; CSU area B1/B3; IGETC area 5A/5C; C-ID PHYS 205; transferable to CSU and UC)

Prerequisites: Math 3A

Textbooks:

- Required: *University Physics Volume 1* by OpenStax (ISBN 1938168275, free to download at https://openstax.org/details/books/university-physics-volume-1)
- Recommended: *Portable TA: A Physics Problem Solving Guide, Vol. 1* by Elby (available on Canvas)
- Other supplementary material will be distributed in class and made available on Canvas.

Instructor: Benjamin Stahl
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Office Hours: TBD in Room 100, Peralta Science Annex, 860 Atlantic Ave., or by appointment

Class: Lecture (20239) Monday 6:00 – 6:50 PM, Wednesday 6:00 – 8:50 PM and Lab (20240) Monday 7:00 – 9:50 PM, both in Room 100, Peralta Science Annex, 860 Atlantic Ave., Alameda.

Course website: on Canvas at https://peralta.instructure.com

Learning Outcomes:

1. Students apply the concepts of physics to everyday situations.
2. Students develop descriptions of physical systems using mathematics and calculate measurable quantities.
3. Students set up laboratory equipment safely, plan and carry out experimental procedures, identify possible sources of error, reduce and interpret data, and prepare clear written reports.

Tutoring: Physics tutors are usually available in the Tutorial Center in the Math Lab on the 2nd floor of the LRC. Register for the free COA course, Learning Resources LRNRE 501, 24 hours in advance of using any tutoring services. Physics tutoring is also available at the MESA center in Room 125.

Course Policy

Registration: After the last day to register for classes (Feb. 4), you must be registered in the class in order for you to receive credit. No students can be added after this date.

Attendance: Please come ready to work at the beginning of every class. A student who exceeds six unexcused absences may be dropped from the course (there are six class meetings per two-week period; refer to pg. 31 of the College of Alameda 2017-2019 catalog for the college policy on attendance).

Participation: Questions are highly encouraged during lecture (please direct them to me, not your neighbors). *Answering* questions is even more encouraged. Please come ready to participate in occasional group discussions and work. Taking notes is good, but participating is *better*.

Disruptions: Please take care of your personal needs before class, or during scheduled breaks. Also, please turn off cell phones and other communication devices and put them in your bag. If you must arrive late or leave early, or take other breaks, please do so quietly without disrupting other students. See pg. 237-238 of the College of Alameda 2017-2019 catalog for student standards of conduct. (In short, please act like an adult.)

Academic Integrity: Everything you turn in must be your own work. If you use sources other than the textbook, please clearly cite them and give credit where it is due. Allowing another student to copy your own work also constitutes academic dishonesty. Please refer to pg. 237-246 of the College of Alameda 2017-2019 catalog for the college policy on academic dishonesty and possible disciplinary measures.

Grading Policy

Course Grade Breakdown:

- Homework (20%): assigned weekly and submitted electronically for grading with instant feedback
- Labs (20%): about 10 labs assigned throughout the semester
- Midterm Exams (40%): three (3) midterm exams throughout the semester
- Final Exam (20%): one (1) comprehensive final exam during the finals week

Grading Rubric: A holistic grading scale will be used for exam problems (scaled to the number of points in the problem).

- 5 (out of 5 points possible): Excellent understanding. The student clearly understands how to solve the problem; one or two minor mistakes can appear on a "5" solution, if they don't lead to larger conceptual errors.
- 4: Good understanding. The student understands the main concepts and problem-solving techniques but is missing one major concept, or made one major mistake that may involve conceptual misunderstanding.
- 3: Fair understanding. The student started to set up the solution and is on the right track of applying the problem-solving techniques but is several major steps (or mistakes) away from being able to solve it.
- 2: Poor understanding. The student jots down some formulas that may be relevant to the problem but shows little conceptual understanding of how they should be used.
- 1: No understanding. The student writes down something that has something to do with the problem.
- 0: Blank answers.

Course Grade Scale: The following is the course grade scale.

A: 85 – 100%	B: 70 – 85%	C: 50 – 70%	D: 40 – 50%	F: below 40%

Homework: There will typically be a homework assignment each week. In general, these will be assigned on a Monday and due the following Monday before the beginning of class. Assignments will be viewed and submitted online through Canvas.

Labs: Come prepared with writing instruments (pen and paper) and a calculator.

- Please arrive on time, so that your group can start on time. If you are tardy by more than 10 minutes, the instructor may exclude you from participating in the lab in order to avoid unduly burdening other students.
- For all labs: follow all lab directions carefully and ask questions. The purpose of the lab is to help you develop physical intuition—make sure you do that during the assigned lab time (do not plan to "do it later").
- All labs are due at the end of the lab period unless there are extenuating circumstances.

Exams: Midterm and final exams will be given on following days and times:

- Exam 1, 2, and 3 (in class): February 21, April 11, and May 9.
- Final Exam (during final exam period): Wednesday, May 23 6:00 – 9:00 PM

Note: All exams (including the final) will be held in Room 110, Peralta Science Annex, 860 Atlantic Ave.
Please contact me immediately if you have any unavoidable conflicts with these times. There are no scheduled make-up exams. If you have an unavoidable conflict, you must make an arrangement for the missing exam with me individually.

Disabilities: Students who may need accommodation for their disabilities are encouraged to contact the Disabled Students Program and Services (available in Room D-117 or by phone, 510-748-2328) as early as possible in the semester so that reasonable (and legally-mandated) accommodations may be made by the instructor and college. Usual accommodations made include: extended exam time, low-distraction exam environment, and/or note-takers. Most students with a diagnosed learning disability (such as ADHD) are eligible. If you are not sure whether you are eligible, please check with a DSPS counselor. The details regarding the nature of your disability are confidential and not shared with your instructor.

Physics 4A Schedule, Spring 2018

Wk	Class Plan			References	Notes
1	M LEC (Jan 22) Introductions & 1-D Kinematics	M LAB (Jan 22) Lab 1: Measurements and Uncertainty (Errors)	W LEC (Jan 24) 1-D Kinematics Cont'd	O. Stax Ch 1, 3 P. TA Ch 1 – 3	
2	M LEC (Jan 29) Intro to Vectors & 2-D Kinematics	M LAB (Jan 29) Lab 2: Motion	W LEC (Jan 31) 2-D Kinematics: Projectile Motion	O. Stax Ch 2, 4 P. TA Ch 4 & 5	Last week to add & drop w/o W
3	M LEC (Feb 5) Newton's Laws of Motion	M LAB (Feb 5) Lab 3: Projectile Motion	W LEC (Feb 7) Forces: Gravity & Normal Force	O. Stax Ch 5, 6 P. TA Ch 6, 7	
4	M LEC (Feb 12) Forces: Friction	M LAB (Feb 12) Lab 4: Dynamics	W LEC (Feb 14) Newton's Laws: Review & Additional Problems	O. Stax Ch 5, 6 P. TA Ch 8, 9	
5	M LEC (Feb 19) **President's Day – No Class**	M LAB (Feb 19) **President's Day – No Class**	W LEC (Feb 21) **Exam 1: Kinematics and Newton's Laws**		See posted Portable TA chapters for exam prep
6	M LEC (Feb 26) Uniform Circular Motion	M LAB (Feb 26) Lab 5: Forces in Equilibrium	W LEC (Feb 28) Circular Motion: Applications	O. Stax Ch 4 P. TA Ch 10	
7	M LEC (Mar 5) Work and Energy; Conservation of Energy	M LAB (Mar 5) Lab 6: Conservation of Energy	W LEC (Mar 7) Spring Force & Potential Energy	O. Stax Ch 7, 8 P. TA Ch 11, 12	
8	M LEC (Mar 12) Linear Momentum, Impulse, Momentum Conservation	M LAB (Mar 12) Lab 7: Ballistic Pendulum	W LEC (Mar 14) Application of Conservation Laws	O. Stax Ch 9 P. TA Ch 12, 13	
9	M LEC (Mar 19) Intro to Torque; Static Equilibrium	M LAB (Mar 19) Lab 8: Rotational Inertia	W LEC (Mar 21) Rotational Dynamics and Rotational Inertia	O. Stax Ch 10, 12 P. TA Ch 14, 15	
10	M LEC (Mar 26) Angular Momentum	M LAB (Mar 26) *Problem-Solving Session: Rotation*	W LEC (Mar 28) Angular Momentum, Cont'd	O. Stax Ch 10, 11 P. TA Ch 15, 16	
Spring Break					
11	M LEC (Apr 9) Exam 2 Review	M LAB (Apr 9) *Problem-Solving Session: Mechanics*	W LEC (Apr 11) **Exam 2: Force, Energy, Momentum, and Rigid-Body Rotation**		See posted Portable TA chapters for exam prep
12	M LEC (Apr 16) Static Equilibrium	M LAB (Apr 16) Lab 9: Static Equilibrium	W LEC (Apr 18) Newton's Law of Universal Gravitation	O. Stax Ch 12, 13 P. TA Ch 17-19	

- Schedule is subject to change, but I will try to keep to it as much as possible
- Some of the lab periods are used for problem-solving sessions (exam practice) and group work. Please come ready to work; all students are expected to attend every class session.

Wk	Class Plan			References	Notes
13	M LEC (Apr 23) Simple Harmonic Oscillation	M LAB (Apr 23) Lab 10: Oscillations	W LEC (Apr 25) Simple Harmonic Oscillation Cont'd; Oscillations	O. Stax Ch 15 P. TA Ch 20	Last week to drop with W
14	M LEC (Apr 30) Intro to Waves	M LAB (Apr 30) Lab 11: Standing Waves	W LEC (May 2) Waves and Sound	O. Stax Ch 16, 17 P. TA Ch 21	
15	M LEC (May 7) Exam 3 Review	M LAB (May 7) *Problem-Solving Session: Oscillations and Waves*	W LEC (May 9) **Exam 3: Equilibrium, Oscillations, & Waves**		See posted Portable TA chapters for exam prep
16	M LEC (May 14) Fluids Intro	M LAB (May 14) *Group Work: The Mechanical Universe*	W LEC (May 16) Fluids Cont'd; Semester Review	O. Stax Ch 14 P. TA Ch 22	
Fin			W Final (May 23) **Cumulative Final Exam**		See posted Portable TA chapters for exam prep

Tips for Success in Physics 4A

You may find the following comments and advice useful as you take this class.

My goal in grading is to reward two things: (1) the effort you put into this class, and (2) your understanding of physics and intuitive grasp of physical concepts. If you want to just pass this class, I have good news: *my* goal is to pass every student who stays engaged with the course throughout the semester. But most of you—especially those who want to transfer for an engineering degree—will want to do better than a C. So, how do you get a B or an A in this class?

The only way to do this is to demonstrate that you can *solve* problems involving a physical situation, like an engineer, chemist, or a physicist might. There are techniques and strategies that will help you do that (*some* of them, I will spend a fair amount of class time teaching). There are some tips and tricks that can simplify problem solving (you will see some in lecture and more in your textbook and homework). In the end, the goal is to learn how to solve physics problems.

So, how do you learn how to solve problems? Here's what you need to do:

- First, attend and fully participate in every class (7 hours every week), and organize your life so that you have about 8 hours of study time each week—that's over 2.5 hours for every day you don't have class. A total of 15 hours per week *is* what you are expected to spend for a 5-unit class.
- Second, get your reading done early. We move at a pace of about one chapter each week. This is about 20 pages per week of dense, technical reading. Some of you might get this done in 30 minutes; some may need 2 hours. After you are done reading, you still have about 6 hours of studying outside the class to do.
- Third, practice solving problems. This is where you should spend those 6 hours/week of study time. For your problem-solving practice, two important resources are available to you:
    - Homework problems (solutions will be made available after assignments are submitted)
    - *The Portable T.A.*

  The Portable T.A. is a particularly useful resource, because you can *immediately* check if you did the problem right. I want all of you to get to a point when you simply know that you did a problem right, but until you get to that point, it's a useful source for feedback.

That's enough advice for the first day. Attend every lecture and lab, and you will see the types of problem-solving techniques you will need, alongside the examples of physical intuition you should develop as an engineer or a scientist.