University Physics

CALIFORNIA COMMUNITY COLLEGES ONLINE EDUCATION INITIATIVE

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Course Overview

Course Code and Semester: **Physics 4C, Class Number 24362, Spring 2022**
Course Description: Comprehensive study of major topics of physics: Light, interference, relativity, quantum physics, atoms, molecules, and nuclei. (Satisfies COA AA/AS area 1; CSU area B1 and B3; IGETC area 5A and 5C; transferable to CSU and UC)
Prerequisites: Physics 4B and Math 3C
Co-requisites: Math 3E and 3F

Who should take this course?

- Intended physics, astronomy, and engineering major students needing the third semester of calculus-based physics.
- Interested students who wish to learn mathematical treatments of special relativity and quantum mechanics (we also cover optics).

If you are taking Physics 4C to meet a transfer requirement, please check with your transfer institution and department. Not all engineering and physical science majors require Physics 4C. Nearly all physics and astronomy majors do require Physics 4C.

Student Learning Outcomes

1. Students discuss and apply the concepts of physics.
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.

Instructor Information

Hi! My name is **Andrew Park**. The best way to contact me for course-related matters is through Canvas **Conversations** tool (for non-course matters, best way is by email **bpark@peralta.edu** (mailto:bpark@peralta.edu)). You will hear from me regularly throughout the semester, usually through the **Course Announcements**. If you need to talk (rather than write) to me individually, please see office hour information below.

Lab Sessions

This **hybrid** course has 100% online lecture section and 100% face-to-face lab section. The lab sessions are scheduled for **Wednesdays in ATLAN 100 from 6 p.m. to 9 p.m.**, in Peralta Science Annex at 860 Atlantic Avenue. Please see **COVID-19 safety guidelines** (https://safe.peralta.edu/covid19-student-resources) on safe.peralta.edu and follow those instructions each time you attend lab.

Office Hours / Virtual Class Sessions

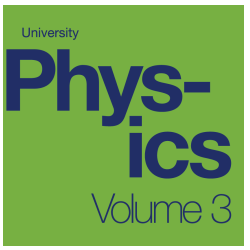
Updated Beginning of Semester

Following are office hours and virtual class session schedule for Spring 2022. Online virtual class session (attendance-optional; most of it recorded) is held on [DAY TBD; TIME TBD]. Reminder and agenda of the session is announced earlier in the day.

In-person office hours will be held in **ATLAN 100 (Physics Lab Room) on Fridays 11 to 2 p.m.** Drop by with any questions, or just to work on course content using the building WiFi.

For appointments outside of regularly scheduled office hours, please email me to arrange for the time. I usually respond to emails within 24 hours, and often sooner.

Course Materials



Your course materials are free and available digitally. Our primary and required textbook is *University Physics Volume 3* by OpenStax. You can read it by:

- Accessing it online on **openstax.org (https://openstax.org/books/university-physics-volume-3/pages/1-introduction)** ,
- Downloading the **PDF (https://d3bxy9euw4e147.cloudfront.net/oscms-prodcms/media/documents/UniversityPhysicsVolume3-OP_pHRSWNy.pdf)** (about 46 MB), or
- Using additional access options on **OpenStax (https://openstax.org/details/books/university-physics-volume-3)** .

Relevant textbook sections will be linked to from the Canvas pages, along with additional material on as-needed basis. One material I anticipate referring to from time to time is the classic ***Feynman Lectures on Physics*** **(https://www.feynmanlectures.caltech.edu)** (beware it does not cover topics in traditional order; I'll place them into proper context for the excerpts we will use).

Important Notes

Grading Contract

This is something I started experimenting with in Spring 2020, somehow just in time for COVID-19. I think it is particularly relevant as we move on from traditional methods of assessments such as exams, which are not very reliable when I, as instructor, cannot control the exam conditions very well.

In **contract grading (https://en.wikipedia.org/wiki/Contract_grading)** , rather than attempting to associate an overall percentage to the letter grades I will assign (with different weights for homework, exam, etc.), we list the conditions you need to meet in order to earn each of the grades (A, B, or C, for passing grades). There is an element of clear communication of expectations, and flexibility according to circumstances (I am open to negotiating your contract on individual basis).

For full description, please see **Physics 4C Grading Contract** (may need to unlock Module requirements to access the page).

ADA Accommodation

Students who may need accommodation for their disabilities are encouraged to contact **Student Accessibility Services (https://alameda.peralta.edu/dsps)** as soon as possible in the semester so that reasonable (and *legally mandated*) accommodations may be made. The contact information is at the bottom of the SAS website (if you are in a hurry, this is their email: **SAS.Alameda@peralta.edu (mailto:SAS.Alameda@peralta.edu)**). Usual accommodations made include extended exam time and/or transcription service. Most students with a diagnosed learning disability (such as ADHD or ADD) are eligible. If you are not sure whether you are eligible, please check with a SAS counselor. The details regarding the nature of your disability are confidential and not shared with your instructor.

Instructor's personal note: In my experience, many students who SHOULD HAVE utilized this service do not use them and suffer consequences academically. The goal of SAS (and ADA in general) is that you should be judged on your ABILITY, not disability. For those students who are eligible, the ADA accommodation is what will help you express your full potential (not a special treatment or something to be stigmatized against).

Talk to a SAS counselor today; the worst that can happen is they will tell you that you are not eligible and you wasted a little bit of time.

Tutoring and Academic Support

For tutoring support during COVID-19, please check **Learning Resources Center (https://alameda.peralta.edu/student-service/learning-resource-center/)** website for access information.

Additional online tutoring may also be available through Online Tutoring link in Canvas course sidebar. Please let me know if there are any issues in accessing any of these academic support services, so that I can help.

Preferred Names and Pronouns

Please help me refer to you in the way you prefer by completing following two things at the beginning of the semester:

- **[GRADED DISCUSSION] Introduce Yourself** (also accessible from Modules, may need to complete Module requirements to access)
- Name Coach entry (see Canvas course sidebar).

I will always do my best to pronounce your name correctly and refer to you with respect. Please help me do that by correcting me if I mispronounce your name—or any other mistakes I may make unwittingly in how I refer to you.

Tips for Success in Physics 4C

Follow these advices to maximize your chance of success in this class.

First, here's a little bit on my grading approach. My goal in grading is to reward two things: (1) the effort you put into this class, and (2) your understanding of laws of physics. If you want to just pass this class, I have a good news: *my* goal is to pass every student who stays engaged with the course to the end of the semester. But most of you 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 that is to demonstrate that you can *solve* problems involving a physical situation, like an engineer or a scientist might. In some sense, it's the same thing you had to do since your first semester of engineering physics, and the same problem-solving techniques you have been using will continue to apply (and some resources will be provided for individual and group reviews of these). Physics 4C is best approached as a continuation of Physics 4B: you are learning new laws of physics (optics, waves, special relativity, quantum mechanics, etc.), while continuing to apply problem-solving techniques from previous physics courses and continuing to develop new intuition for new laws of physics.

So, how do you excel in this class? Here's what you need to do:

- First, realize that this mostly online class requires more self-discipline and integrity, as well as a level of comfort with technology, than face-to-face classes do. Set aside a time to regularly work on the assigned readings and problems, and be proactive in contacting me if you have any issues with Canvas, or any other technologies being used for the class. (Read more: **Orientation to Online Learning**; while labs are important, don't let them take away from studying time for the lecture materials!)
- 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 lecture videos to watch and homework problems to work on (estimated at about 6 hours per week).
- Third, practice solving problems. This is where you should spend those 6 hours/week of study time. For your problem-solving practice, the most important resource available to you are the homework problems. The homework problems represent the topics covered and emphasized in this class, as well as the difficulty level of the problems you should be able to do after studying. I am available in multiple modalities (email, office hour, etc.) to help when you get stuck.

That's enough advice to start with. In lecture videos (and homework assignments), I will emphasize key physical laws you need to know, point out common conceptual mistakes, and problem-solving techniques to simplify problems—alongside the examples of physical intuition you should continue to develop as an engineer or a scientist.

I believe it is possible not only for every one of you to pass this class but also for everyone to do so with a grade of B or better—all that is needed is for you to have a little bit of self-discipline and to put in a consistent effort.

Calendar and Assignments

The **Modules** view in Canvas shows all course materials, assignments, and due dates on a single page. The **Canvas Calendar** will be used to manage appointments for certain things; reminders of Zoom sessions (mostly virtual class sessions, an office-hour replacement) held at regular times will be sent as announcements on the day of the session. Please look below for summary of topics covered, with textbook references. Fine-print details are below—I encourage you to read through them (it lays out course policies in detail), but I will remind you of anything that is important.

The Fine Print - Course Policies

Please read on for the full listing of course policy. If you would rather skip it, that is fine; I will remind you of anything that is important.

- **Registration**: After the last day to register for classes (see **academic calendar (https://web.peralta.edu/admissions/category/academic-calendar/)**), 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 lab class. Instructor may drop a student if the number of unexcused absences exceeds 2 (number of times the class meets in two weeks; refer to pg. 26 of **College of Alameda 2021-2022 catalog (https://alameda.peralta.edu/wp-content/uploads/2021/04/CoA-Catalog-21-22_v9_ONLINE.pdf)** for the college policy on attendance). Lecture portion is online and no face-to-face attendance is required for the lecture portion of class. Because we are still in COVID pandemic, if you have COVID-related reasons preventing your attendance at lab sessions, please email me so that we can work out individual accommodations.
- **Academic Integrity**: Everything you turn in must be your own work. If you use sources other than the textbook, please clearly cite it and give credit where it is due. Allowing another student to copy your own work also constitutes academic dishonesty (there is a fine line between group collaboration and dishonest copying of others' work; I will help you see it, as needed). Please refer to pg. 363-368 of **College of Alameda 2021-2022 catalog (https://alameda.peralta.edu/wp-content/uploads/2021/04/CoA-Catalog-21-22_v9_ONLINE.pdf)** for the college policy on academic dishonesty and possible disciplinary measures.
- **Honor Code Pledge**: You must complete the honor code pledge (accessible within the first few course Modules) to continue in this class. Students who do not maintain their honor code pledge may become ineligible to participate in certain course activities or be required to complete activities in a format that allows a greater degree of monitoring by the instructor.
- **Schedule Subject to Change**: Assignment and assessment schedules are subject to change. Any changes will be announced through Canvas.
- **Late Assignments**: All assignments are due on the date noted. Canvas will accept late submissions on essay or discussion assignments (the instructor reserves right to grade late submissions in appropriate cases). MyOpenMath assignments must be extended using a "late pass". Twenty-four late passes are given at the beginning of semester, and each late pass extends a MyOpenMath assignment deadline by 72 hours. Satisfactory progress through the course in a timely manner is required to pass the class.
- **Allowed/Prohibited Items During Timed Assessments (open book)**: Certain assessments are timed and are used similarly as "exams" in face-to-face classes. Following is the description of what you may use and what you may not use during these assessments.
  - Allowed: calculators, foreign language dictionaries, any material that is provided in the context of the course (usually through Canvas), and the means used to access the assessment.
  - Prohibited: any outside help, including but not limited to: (a) any individual other than the instructor providing help during the exam, (b) external websites, unless they are used purely for calculation function, and (c) external references, either in digital or paper-bound format, other than those allowed above.
- **Holistic Grading Rubric**: A holistic grading scale is used for grading an essay or freeform-answer questions.
  - 5 (out of 5 points possible): "Excellent understanding." The student clearly understands how to solve the problems; 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 from memory 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." Blank answers.

Any requests for consideration of grade change must be submitted in writing.

- **Course Grading Contract**: This course uses **contract grading (https://en.wikipedia.org/wiki/Contract_grading)**. Please review the "default grading contract" in **Physics 4C Grading Contract** and understand what you need to earn an A, B, or C. Please reach out to the instructor with any questions about the default grading contract or if you wish to amend particular provisions for you, by mutual agreement between you and the instructor.

Topics Covered

Following is the 14-week schedule of topics being covered (shortened in Spring 2022 from the normal 16-week schedule). Chapter references are for OpenStax ***University Physics Volume 3*** **(https://openstax.org/details/books/university-physics-volume-3)**, unless otherwise stated.

- **Week 1: Optics Intro** (Chapter 1)
- **Week 2: Geometric Optics** (Chapter 2)
- **Week 3: Interference** (Chapter 3)
- **Week 4: Diffraction** (Chapter 4, first half)
- **Week 5: Physical Optics Applications** (Chapter 4, second half)
- **Week 6: Special Relativity Introduction** (Chapter 5, first half)
- **Week 7: Relativistic Dynamics** (Chapter 5, second half)
- **Week 8: Relativity Review and Applications** (Chapter 5 and additional materials)
- **Week 9: Quantum Mechanics Introduction** (Chapter 6)
- **Week 10: Wave Mechanics Introduction** (Chapter 7)
- **Week 11: Quantum Mechanics Review and Applications** (Chapters 6 and 7, and additional materials)
- **Week 12: Atomic Physics** (Chapter 8)
- **Week 13: Radioactivity and Nuclear Physics** (Chapter 10)
- **Week 14: Particle Physics** (Chapters 11)