

Elementary Mechanics and Heat – Physics 105-703
Fall 2023
SUNY Cortland Physics Department

Catalog Description

An algebra-based introduction to mechanics and heat. The methods of science and applications to diverse fields are stressed. Fulfills: GE 2; LASR. (4 cr. hr.)

The Point of this Class

Physics is an exciting and demanding subject. Physicists make predictive models of reality based on assumptions about the nature of our world. If a model's predictions are born out experimentally then the elements of the model tell us about the physical laws that govern our world. In Physics 105 we will be covering mechanics and thermodynamics. This entails learning physical laws, the mathematical machinery that allows these laws to be quantitatively predictive, assessing the validity of these laws experimentally, learning various techniques to help organize your thinking about a physical situation and most importantly developing the ability to reason your way through the application of these tools to physical situations.

At the end of this course you must:

- Have a firm understanding of: the motion of an accelerating object, the motion of an object subject to external forces, the implications of the conservation of energy and momentum for the motion of a set of objects, how an object rotates, the behavior of fluids and gases, and the way that temperature heat and entropy relate to each other, and the behavior of waves and oscillations.
- Demonstrate the ability to apply this understanding to analyze new situations using the problem solving techniques presented in this course.
- Be able to carefully analyze data taken in lab, estimate the uncertainty in the analyzed results, draw valid conclusions from the results, and present the results in an appropriate and coherent manner.
- Reflect on the process and context of the scientific and technological enterprise and its ethical implications.

Physics 105 provides a sound foundation for the biological sciences.

Basic Information

Instructor: Doug Armstead

Office: 127 Bowers (607) 753-2919

Office Hours: M 10-11am, T 11-noon, W 3-4pm, F 10-11am. These are just the times I guarantee. I am available other times so feel free to drop by or to contact me for an appointment.

Email: douglas.armstead@cortland.edu

Course website: www.facultyweb.cortland.edu/douglas.armstead/F23/Phys105.html.

Lecture: meets MWF 1:50-2:40pm in Sperry 105.

Recitation: Attendance is part of your grade. Be sure to attend the section you register for.

Laboratory meets: Various times in either Bowers 1110 or 1112.

Core Class Text: *College Physics 2e* by Urone and Hinrichs published by OpenStax. (required)

Support Text: *Math and Graphing Skills* by Lawrence, Burke, and Hintze published by Pacific Crest. (required)

Support Text: *Algebra and Trigonometry 2e* by Abramson, published by OpenStax. (recommended)

Laboratory Manual: Required purchase at bookstore.

Prerequisites: A good background in algebra and trigonometry.

Expectations

What you should expect from me:

- Explanations of physical concepts that include concrete examples and, where reasonable, demonstrations.
- In-class examples that help you to understand the kind of reasoning that is necessary to do the problems you will encounter in the homework and on exams.
- Careful and respectful consideration of your questions.
- An open door policy—if my office door is open you should feel free to come in and talk about physics. This is in addition to my regularly scheduled office hours listed above.

What I expect of you:

- Your presence in class, both physical and mental, for the entire class period.
- For you to be prepared when you arrive at class. This includes completing the assigned readings before you arrive. A careful reading means keeping track of questions the reading inspires and bringing them to class with you. It also includes working through the Examples and then comparing your result with the one provided in the text.

- When you have a question, ask it. I strongly encourage you to do this during class since one topic builds on the last. Your fellow classmates will thank you—if you are unclear on something, chances are the person next to you is, too.
- Be considerate of your fellow classmates by turning off your cell phones during class and not eating in class.
- Submit work for grading that is your own. If you copy from another student or source and submit it for a grade, then you risk failing the course.

Grades

You start this class out with an A. Over the course of this semester your grade will be adjusted based on the degree of mastery of the material you show through your homework, in your labs, on the midterm exams and on the final exam. The final score for the class has the following weighting:

10%	Problem sets
20%	Labs
5%	Recitation attendance
40%	Midterm Exams #1&2
5%	Reports
20%	Final Exam

Note: the lab is a required part of this course. You will fail the course if you miss more than 3 lab sessions (unexcused absences).

Graded Elements

Problem sets: Problem sets (typically 5-15 problems) will be assigned frequently and due most weeks at 5pm. You are welcome to work in groups to understand the problem but you must independently write your solution.

Solution Format:

- All pages must be stapled together.
- Use a dark pencil or pen.
- The logic of your solution should begin with a clear statement of the basic principle(s) and flow from complete sentences and clear diagrams. Each step should follow clearly from the one before.

Seldom will your first attempt at a solution be of the quality you should hand in. I expect you to proofread, correct, edit, and generally clean up your solutions.

Labs: Your lab grade will be determined by averaging your graded labs, note that missing 3 lab sessions leads to automatic failure of the course.

Exams: The exam format will include problems that probe both your conceptual and quantitative understanding of the material. Exams will be taken in class and you will be allowed one 3x5 index card with your own notes on it for each exam. The final exam will be cumulative. **If there is a conflict with a test because of a college-sponsored function, I must be notified in advance and arrangements made prior to the exam. Failure to do so will result in a zero for that exam. In case of emergency I must be notified immediately.** A make-up exam will only be administered for illness that requires confinement to bed on physician's orders, death/serious illness in the immediate family, or appearance in court. Supporting documentation will be required.

Reports: You will be required to prepare each of the following two types of reports. Address how a journal article you review relates to your major. Address the societal and ethical implications of the science in a journal article you review. Details including suggested journals to draw articles from are available on the course website.

The raw score above is turned into a grade as follows:

Final %	Grade
90-100	A- to A
80-89	B- to B+
70-79	C- to C+ etc.

Academic Integrity¹

Honesty is an essential part of academic integrity and at the heart of scientific research. Scientists and other scholars take pride in ownership of their own work. They do not take credit for the effort or ideas of others and do not tolerate those who do. This includes cheating, plagiarism and not contributing to group projects. This concept is based on mutual trust. If you cheat you are chipping away at your own moral character and undermining the overall integrity of our college society. Violations of this trust are acts of academic dishonesty; offenses will not be tolerated and may result in a zero on that assignment or in failure for the course.

Obviously, cheating on tests or quizzes involves using information to which you are not entitled such as copying or receiving information from a classmate or using notes other than those permitted by the instructor.

Plagiarism, according to *Webster's New Collegiate Dictionary* is to steal or pass off the ideas and words of another person as new and original an idea or product derived from an existing source. Obviously using work from another student who has previously taken this course is plagiarism.

Group work and group projects are valuable learning experiences, and will be the basis of most lab work. However, it is a form of dishonesty to claim credit for work to which you have not contributed.

¹Adapted from Dr. William L. Johnson's statement of academic integrity.

I encourage students to work together in discussing methods of solutions to problems in homework assignments. Seek help from the instructor, but only after you have reached an impasse in your own concentrated effort. Much valuable learning can occur in the *active participation* in such discussions. However, because you are placing your name alone on an assignment, you should then write up your own original solutions. You are not being honest if you just copy another's solution without any thought of your own.

READ (and understand) the College's statements and procedures on Academic Integrity in the Undergraduate Catalog. Ask the instructor if you have any uncertainty about what is proper and what is not.

Disability Statement

As part of SUNY Cortland's commitment to a diverse, equitable, and inclusive environment, we strive to provide students with equal access to all courses. If you believe you will require accommodations in this course, please place a request with the Disability Resources Office at disability.resources@cortland.edu or call 607-753-2967. Please note that accommodations are generally not provided retroactively so timely contact with the Disability Resources Office is important. All students should consider meeting with their course instructor who may be helpful in other ways.

Diversity Statement

SUNY Cortland is dedicated to the premise that every individual is important in a unique way and contributes to the overall quality of the institution. We define diversity broadly to include all aspects of human difference. The College is committed to inclusion, equity, and access and thus committed to creating and sustaining a climate that is equitable, respectful and free from prejudice for students, faculty and staff. We value diversity in the learning environment and know that it enhances our ability to inspire students to learn, lead and serve in a changing world. We are committed to promoting a diverse and inclusive campus through the recruitment and retention of faculty, staff and students. As a community, we hold important the democracy of ideas, tempered by a commitment to free speech and the standards of inquiry and debate. To this end, we are dedicated to developing and sustaining a learning environment where it is safe to explore our differences and celebrate the richness inherent in our pluralistic society.

Inclusive Learning Environment Statement

SUNY Cortland is committed to a diverse, equitable and inclusive environment. The course instructor honors this commitment and respects and values differences. All students enrolled in this course are expected to be considerate of others, promote a collaborative and supportive educational environment, and demonstrate respect for individuals with regard to ability or disability, age, ethnicity, gender, gender identity/expression, race, religion, sex, sexual orientation, socio-economic status or other aspects of identity. In an environment that fosters inclusion, students have the opportunity to bring their various identities into conversation as they find helpful, but are not expected to represent or speak for an entire

group of people who share aspects of an identity. If you have any questions or concerns about this statement, contact the Institutional Equity and Inclusion Office at 607-753-2263.

Title IX Statement

Title IX, when combined with New York Human Rights Law and the New York Education Law 129-B, prohibits discrimination, harassment and violence based on sex, gender, gender identity/expression, and/or sexual orientation in the education setting. The federal Clery Act and NY Education Law 129-B provide certain rights and responsibilities after an incident of sexual or interpersonal violence. When a violation occurs, victims and survivors are eligible for campus and community resources. Where the College has jurisdiction, it may investigate and take action in accordance with College policy. If you or someone you know wishes to report discrimination based in sex, gender, gender identity/expression, and/or sexual orientation, or wishes to report sexual harassment, sexual violence, stalking or relationship violence, please contact the Title IX Coordinator at 607-753-4550, or visit cortland.edu/titleix to learn about all reporting options and resources. (Updated by SUNY Legal Feb. 1, 2018).

Class Schedule

All dates are tentative.

Week	week starting	Chapter(s)	Topic
1	Aug. 28	1	Intro, Units, Models, Math
2	Sept. 4	2	1-D motion (Labor day on Monday, no class.)
3	Sept. 11	4	Forces in 1-D
4	Sept. 18	4 & 3	Forces in 1-D and Motion in 2-D
5	Sept. 25	3 & 4	Motion and Forces in 2-D
6	Oct. 2	5	More Forces in 2-D Test: Chapters 1, 2 and 4 on Fri. Oct. 6.
7	Oct. 9	5	Forces in 2-D
8	Oct. 16	6	Uniform Circular Motion (Fall Break on Monday, no class) Report 1 due on or before Wed. Oct. 18.
9	Oct. 23	6 & 7	Gravity, Work and Energy
10	Oct. 30	7	Energy Cont.
11	Nov. 6	8	Momentum Test: Chapters 3-7 on Fri. Nov. 10.
12	Nov. 13	9	Statics and Torque
13	Nov. 20	10	Rotations Report 2 due on or before Mon. Nov. 20. (Thanksgiving on W-F, no class)
14	Nov. 27	11, 12 & 13	Fluids, Temperature and Gases
15	Dec. 4	14 & 15	Heat and its transfer, Thermodynamics, and Review

Final Exam TBA