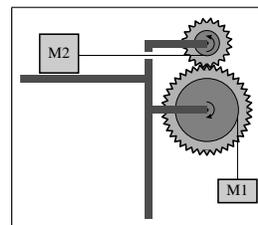


Physics 151
Accelerated Physics I: Mechanics and Thermodynamics
Lafayette College
Spring 2026



Course operations

Instructor

Prof. David Nice
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<http://sites.lafayette.edu/niced>

Locations and times

Class: Monday, Wednesday, Friday, 9:30-10:20
Hugel Science Center 142

Lab: Sec. 1: Monday 7:00-9:45, Hugel 123
Sec. 2: Tuesday 1:15-4:00, Hugel 119

Communication

From time to time, I will send E-mail messages related to this course. Please check your E-mail regularly.

Website

Handouts, homework assignments, etc., will be distributed on paper and posted on Moodle.

Office hours

I will have office hours Wednesday and Thursday mornings 10:30-11:50 and Wednesday afternoons 4:00-5:00. These times may evolve over the semester. My schedule of office hours will always be posted on the course Moodle page. I am often available to meet at other times, so please E-mail any time you would like to talk.

Text

The course textbook is Young and Freedman, *University Physics with Modern Physics and MasteringPhysics* 15th edition. Typically this is accessed as an electronic textbook, although it is also possible to purchase it as a printed book. We will also use the *Modified Mastering Physics* online homework system associated with the textbook.

Normally eText and Mastering Physics access are purchased as a single bundle. Two options are:

- ISBN 9780136781998: 18 week access + Mastering + eText
- ISBN 9780135206331: 24 month access + Mastering + eText

The first option is listed through the campus bookstore.

The homework section of this syllabus, below, gives further details or accessing Mastering Physics.

The same text is used for PHYS 131, 133, 151, and 152.

While the text is an important resource, classes and homework sets will be your primary guide to what you need to know to succeed in this course. Skim through the assigned sections of the text, but read through the examples carefully. Use the text as a reference as you work homework problems and study for exams.

Homework

There will be weekly homework assignments. They are the heart of this course. You don't learn physics by reading about it, or by hearing lectures about it, or by watching someone else do it. You learn it by doing it yourself: Doing real experiments in lab and doing real calculations in homework.

Homework will be a combination of on-line and traditional paper homework. The on-line portion will use MasteringPhysics, <https://mlm.pearson.com/enrollment/nice97042/>. Our course code in Mastering Physics is "nice97042" and the course name is "PHYS 151 Spring 2026." After registration, access the course via <https://mlm.pearson.com>. When you register, set your StudentID to your Lafayette E-mail, e.g., "einsteia@lafayette.edu". This simplifies record-keeping.

Paper homework will be submitted on paper in class. If you work on a tablet or similar device, print your work for submission.

Paper homework will be graded on a combination of accuracy (generally 10 points per problem) and neatness, organization, and meticulousness (equivalent to 3 points per problem). More details of the latter will be given with the first homework assignment. The goal is to motivate you to be neat, organized, and meticulous while you are working through the problems in order to maximize your clarity of thought and accuracy of calculation. These are important skills for scientists and engineers.

Homework will be due in class on Fridays. Late papers will be accepted through the following Monday. Scores for late Mastering Physics problems will be reduced in proportion to how late the work was submitted up to a maximum of 72 hours. Late paper homework may be penalized by 50%. If you are having difficulty completing an assignment on time, or if you have extraneous circumstances (such as illness or family emergency), please contact me.

I strongly encourage you to work with other students on the homework. Try the problems yourself. When you get stuck, talk to someone else about them. Physics is hard. You won't get all the problems on your own. Working in groups is a powerful way to learn. It is also more fun.

Please take advantage of office hours if you have questions about the homework. I am happy to help. Often there will be other students there with questions similar to yours. I expect that most of you will take advantage of office hours sooner or later during the semester.

Labs

Lab is an essential part of the course. You will work on of experiments which are closely correlated with the material we cover in class. You will work with a partner. All lab-related work will be done within the lab period (no pre-work; no after-lab report writeup). Your work will be done in a written lab notebook, which we will provide. Your work will be checked before your leave the lab room. Further details of lab operations will be given at the first lab meeting.

Exams

There will be two midterm exams:

- Midterm exam #1. Tuesday, March 9.
- Midterm exam #2. Tuesday, April 20.

The midterm exams will be held during the Tuesday 1:15 pm lab period instead of doing a lab experiment those weeks. This allows exams to be given over a time period longer than a 50 minute class session, which helps lower time pressure. Students who have conflicts with the standard exam time will be accommodated, with details to be worked out a few days before each exam.

Each midterm exam will be on the material covered in the preceding weeks of class (i.e., since the

previous midterm exam). Detailed topic coverage will be given before each exam.

There will be a comprehensive final exam during finals week covering all material in the course. The final exam will be three hours and will be scheduled by the Registrar.

All exams will be closed book, with equation sheets provided. Copies of the equation sheets will be available in advance. Exam questions will resemble homework problems.

Grading

There must be grades. Your grade will be based on:

Homework	20%
Lab	10%
Midterm Exam #1	20%
Midterm Exam #2	20%
Final Exam	30%

I will post homework and exam grades on Moodle. The exam grades may be re-scaled depending on the difficulty of the exam. I will use the following numerical score when setting letter grades:

A	92.500 and higher	B-	79.500–82.499	D+	66.500–69.499
A-	89.500–92.499	C+	76.500–79.499	D	62.500–66.499
B+	86.500–89.499	C	72.500–76.499	D-	59.500–62.499
B	82.500–86.499	C-	69.500–72.499	F	59.499 and below

Memorization

Knowledge of terminology and notation is an important part of a scientific education. For this course, you are required to memorize the metric prefixes listed below and to know how to use them. They will be tested on midterm exam #1 and may be used in subsequent exams.

Prefix	Abbreviation	Multiplier	Prefix	Abbreviation	Multiplier
tera	T	10^{12}	centi	c	10^{-2}
giga	G	10^9	milli	m	10^{-3}
mega	M	10^6	micro	μ	10^{-6}
kilo	k	10^3	nano	n	10^{-9}

The computer industry uses prefixes to represent multiples of 1024 (e.g., 1 kbyte = 1024 bytes), but in physics they always are factors of 1000 (1 km = 1000 m).

Course description

Overview

From the college catalog: An accelerated calculus-based introduction to the foundations of classical mechanics and thermodynamics, intended for students majoring in science or engineering; a foundation on which an understanding of physics, physical chemistry, or engineering can be built. Topics include dynamics; conservation laws for linear momentum, angular momentum, and energy; mechanical oscillations and waves; and thermodynamics.

Lafayette calculus-based introductory mechanics/electromagnetism courses. We have two such course sequences, Physics 131/133 and Physics 151/152. Physics 151/152 is designed for students with significant prior experience in physics and/or strong interest in the field. Physics 151/152 proceeds more rapidly than Physics 131/133, especially in the first weeks of the semester. This

allows Physics 151/152 to cover material with greater depth and breadth than Physics 131/133. Both course sequences use the same textbook, and students may switch between the sequences after the first semester (i.e., take Physics 131 and then 152, or take 151 and then 133).

Math prerequisite

Math 161 (Calculus I) is a prerequisite of Physics 151. You should understand the fundamental ideas of calculus, and you should have a working knowledge of derivatives and integrals of polynomials, basic trigonometric functions, exponents, and logarithms.

Course goals and topic coverage

A liberal arts education should teach you many different ways to think. A goal of this course is to teach you how to think like a physicist. A second goal is to provide you a foundation for further study in physical science and engineering. We will accomplish these goals by introducing you to the following topics. Specific topic and text coverage will be given on a weekly basis on the homework assignments.

Topic	Text Chapters	Approximate number of class sessions
Units	1	1
Kinematics in one or more dimensions	2,3	5
Newton's laws and applications; universal gravitation	4,5,13	5
Conservation of energy and momentum	6,7,8	10
Rotational motion	9,10	10
Oscillations	14	3
Waves	14,15	3
Thermal radiation, intensity, planet temperatures, greenhouse effect	16,17	4

Outcomes

After completing this course, you will be able to understand, identify, and apply the fundamental principles of physics in a variety of physical situations. You will be able to use both qualitative reasoning and quantitative problem-solving skills in applying those principles. Among other things, you will be able to:

- Model static and dynamic physical situations using qualitative and quantitative models.
- Use and manipulate vector equations for solving physical problems.
- Use conservation laws for scalar and vector quantities.
- Use calculus concepts in analyzing physical situations.
- Analyze oscillatory and wave motion.
- Calculate basic thermal properties of planets and their atmospheres.

Within the Lafayette Common Course of Study, this course will promote the following outcomes for the Study of the Natural World (with lab):

- NW 1. Employ the fundamental elements of the scientific method in the physical and natural world by identifying and evaluating a testable scientific hypothesis.
- NW 2. Create and evaluate descriptions and representations of scientific data via equations, graphs, tables, and/or models.

Course policies

Intellectual honesty

You are expected to abide by the principles of intellectual honesty outlined in the Lafayette Student Handbook available at <http://conduct.lafayette.edu>.

Learning is a collaborative process, I encourage you to discuss and collaborate with other students on homework. “Collaboration” does not mean “copying.” On homework, you must understand and individually write out your answer to each problem.

You may use resources on the internet, including generative artificial intelligence based tools, if they help you learn the material in this course. However, you should work assigned homework problems on your own, or with help from other human beings such as your classmates and/or instructor.

Exams must be done on your own, using only materials specifically allowed.

Attendance

Class sessions. I expect you to attend class sessions. However, attendance is not directly factored into your course grade, and I do not maintain class attendance records. Also, I understand that there are occasional times that students need to miss classes. Having said that, as a courtesy, please let me know if you need to miss class.

Lab sessions. I expect you to complete all the labs, which requires attending the lab sessions. However, you can be excused from lab sessions for such reasons as illness, family emergency, or College-related event (e.g., sports meets). If you need to miss a lab session, please contact me. Missing labs which are unexcused and not made up will be counted as a 3 percentage point penalty out of your total course score for the semester.

Accommodation

My policy. It is important to me that you do well in this class. If you have any disabilities which you feel may interfere with your ability to succeed and prosper in this class, please contact me to discuss ways of accommodating them.

Please also note the following formal guidance from the College. In compliance with Lafayette College policy and equal access laws, I am available to discuss appropriate academic accommodations that you may require as a student with a disability. Requests for academic accommodations need to be made during the first two weeks of the semester, except for unusual circumstances, so arrangements can be made. Students must register with the Office of the Dean of Advising and Co-curricular Programs for disability verification and for determination of reasonable academic accommodations.

Mandatory credit hour statement

The student work in this course is in full compliance with the federal definition of a four credit hour course.

Welcome aboard

I love teaching introductory physics, and I am excited to be leading this class. I hope you are happy to be here. The material will be challenging, but it will be rewarding. Welcome aboard!