

Physics 131 - Physics I: Mechanics

Lafayette College

Academic Year 2023-24 (Spring 2024)

Instructor

Salina F. Ali
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Class meeting times

PHYS 131, Sec. 01 MWF 8:25 AM – 9:15 AM

PHYS 131, Sec. 02 MWF 9:30 AM – 10:20 AM

PHYS 131, Sec. 03 MWF 10:35 AM – 11:25 AM

Lab: Ten sections of lab, taught by different instructors, meet throughout the week in Hugel 123.

Location

Hugel Science Center, Room 100

Office Hours

M: 2-3 pm

W: 2-3 pm

Th: 3-4 pm

For help outside normal office hours, please email me to schedule a time.

Text

University Physics with Modern Physics, 15th ed. by Young and
Freedman with *Modified Mastering Physics*

This class will be participating in the First Day® inclusive access program. **The materials for this course will be available in digital format through Moodle.** Charges for the accessible content are added to the cost of the course upon registration. To access your materials, use the “Course Materials” link in the Moodle course site.

You will have the option to opt out of using the FirstDay inclusive access materials should you wish to purchase the materials another way. The option to opt out will be available until the last day of the add/drop period (Feb. 2nd). To opt out, select the large green [Opt Out] button when accessing the FirstDay inclusive access materials. If you opt out, you will be credited after the add/drop period.

If you need assistance or have questions, please contact Barnes and Noble Customer Care:

- For FAQs or to open a support ticket, visit: <https://customercare.bncollege.com/>
- Email: firstdaysupport@bncservices.com
- Phone: 844-9-EBOOKS (844-932-6657)

Course Description

Physics 131 is the first course in an introductory physics two-semester sequence: Physics 131-133. This course focuses on classical mechanics - that is, we will study how and why objects move the way they do. Many of the physical situations we will look at in this course may be familiar from your everyday life, and we will build on your existing physical intuition (and perhaps contradict it occasionally!) as we formally and mathematically analyze these situations. The model of mechanics we will study in this course is considered “classical” because it came before some more modern breakthroughs in physics such as quantum mechanics (which is important at very small length scales) and relativity (which is important at very high speeds). Nevertheless, classical mechanics is a very successful model which accurately describes motion for the vast majority of situations we encounter in daily life. This course also has some broader goals beyond the specific content of classical mechanics.

We will work on building intuition about the physical world, expressing physical concepts using mathematical and English language, and problem solving.

The course-catalog version of the description of Physics 131 is: “A rigorous introduction to the study of physics for science and engineering majors; a foundation on which an understanding of physics, physical chemistry, or engineering can be built. Kinematics and dynamics with emphasis on conservation laws for linear momentum, angular momentum, and energy. A calculus-based course satisfying degree requirements in all B.S. or A.B. degree programs.”

Prerequisites

Math 161 or 165 (Calculus I) is a prerequisite of this course. It can be waived by permission of the instructor. Physics 131 is a prerequisite for Physics 133.

Other sections of Physics 131

There are five sections of Physics 131 taught this semester, taught by two different professors. Topic coverage will be similar, but homework sets and exams will be different, and course policies and teaching styles may vary between sections. Those of us teaching this course meet regularly and work hard to ensure that grading is equitable across all sections.

Due to space limitations, the registrar may have placed you in a lab section other than the one you requested. If you need to switch lecture sections, you should do so as soon as

possible. Changes can only be made for compelling reasons (e.g., a conflict with another class or other college activity). If you need to switch lab sections, contact lab coordinator Scott Shelley (shelleys@lafayette.edu).

Course Grade

Your course grade will be determined based on a professional judgment of your work on the following scale:

Homework	15%
Quizzes	15%
Lab	20%
Tests	30%
Final Exam	20%

Grade Scale

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	93 and higher	B-	80 – <83	D	63 – <67
A-	90 – <93	C	73 – <77	D-	60 – <63
B+	87 – <90	C-	70 – <73	F	<60
B	83 – <87	D+	67 – <70		

Homework

Homework this semester is expected to be submitted through MasteringPhysics. Homework will be assigned on a weekly basis and will generally be due on Wednesdays at 5 pm. Late assignments will be penalized by 1% every hour they are late. Please plan to manage your time accordingly.

Quizzes

- Quiz dates will be announced at least one week in advance. Each quiz will have a maximum length of fifteen (15) minutes. Quizzes are only allowed to be made up with a Dean's Excuse.
- The lowest quiz grade will be dropped.

Exams

- Tests will be given on the dates indicated on the attached course outline. **Unless the student has a valid Dean's excuse, no makeup tests will be given.** Those absent during a test must make up the test before the next scheduled class, when possible. It is the responsibility of the student to make arrangements with the instructor in advance of the date on which a test is scheduled. Failure to comply with these requirements will result in a grade of zero for the test.
- The final exam will be cumulative, and no make-up exam will be given for any reason. The date and time of the final is set by the Registrar and the date and time will be announced as soon as it becomes available.
- All tests and the final exam are closed book events. A formula sheet will be provided for tests and final exam only.

Attendance and Class participation

Your presence and active participation in class meetings are important to creating the most effective and engaging learning experience. That being said, attendance will not be taken and will not be directly factored into your grade. Missed exams or quizzes are only allowed to be made up with a Dean's Excuse.

Intellectual honesty

You are expected to abide by the principles of intellectual honesty outlined in the Lafayette Student Handbook (available from <http://studentlife.lafayette.edu>). Here are some guidelines specific to this course.

Homework - collaboration

- Learning is a collaborative process. Discussion and collaboration on homework in this course is strongly encouraged. But, make sure you understand your answer to each problem yourself.

Homework - resources

- You may use classmates, SI's, my office hours, and the textbook as resources. Do not seek out solutions to homework problems on the internet; this is considered a breach of intellectual honesty. Finding solutions to homework problems on sites such as (but not limited to) Chegg is not allowed.

Exams and quizzes

- Exams and quizzes must be done on your own, using only materials specifically allowed (typically paper, pencil, the given equation sheet if any, and a calculator). Access to a smartphone or any electronic device besides your calculator is not allowed. For this reason, it is important that you have a regular calculator and do not rely on the one on your phone.

Phones

Please turn phones off during class. You may not use phones or other communication devices during quizzes, tests or the final examination.

Calculators

You may use a calculator on any work for grade in this course, but you may not use the calculator feature of a phone for quizzes, tests, or for the final examination. Scientific calculators are subject to inspection prior to closed-book exams. Calculators are available for short-term loan from the Physics Department office.

Learning Outcomes

By the end of this course, you will be able to

- Understand, identify, and apply the fundamental principles of mechanics in a variety of physical situations.
- Apply qualitative and quantitative problem-solving skills to answer concrete questions and communicate your reasoning to others.
- Describe phenomena in the physical world using the language of mathematics including calculus concepts and vector quantities.
- Identify conserved quantities in a physical system and apply the corresponding conservation laws to extract information about that system.
- Engage in the process of doing physics, including such tasks as developing, testing, and evaluating models, graphing and interpreting experimental data, solving problems, and communicating results.
- Collect and analyze experimental data relevant to testing a hypothesis and evaluate whether the evidence supports, refutes, or leads to the revision of the hypothesis.

Laboratory

The laboratory is an essential part of this course. There you will see and experiment with many of the concepts we cover in class and learn how to approach, analyze, and communicate details of an experiment. You must complete all of the assigned experiments; you will be unable to pass this course unless you both complete all laboratory activities and receive a passing grade for the laboratory part of the course. Further details will be provided by your laboratory instructor.

Supplemental Instruction

Supplemental Instructors (SIs) will be holding problem help sessions multiple times during the week. These sessions are useful ways to practice applying the physics we discuss in class and work through book examples.

Accommodations

In accordance with Lafayette College policy, reasonable academic accommodation and support services are available to students who have a documented disability. It is your responsibility to provide me with the appropriate paperwork from the Accessibility Services Office. More information is available at <https://hub.lafayette.edu/>.

Gender Inclusion

This is a gender-inclusive classroom. I have been provided with a class roster and your legal names. I will gladly honor any requests to be addressed by a different name or pronoun than appears on the class. Please make me aware of any preferences.

Proper Usage of Course Materials & Classroom Recordings

At Lafayette College, all course materials are proprietary and for class purposes only. This includes posted recordings of lectures, worksheets, discussion prompts, and other course items. Reposting such materials or distributing them through any means is prohibited. Such materials should not be reposted or distributed through any means. You must request my permission prior to creating your own recordings of class materials, and any recordings are not to be shared or posted online even when permission is granted to record. If you have any questions about proper usage of course materials please ask me. Please also be in contact with me if you have any concerns with being recorded during the course.

Common Course of Study Outcomes Statement

This course (and particularly the lab component) will promote the following outcomes for Natural Sciences (NS) within the Lafayette Common Course of Study:

- NS 1: Employ the fundamental elements of the scientific method in the physical and natural world by identifying and evaluating a testable scientific hypothesis.
- NS2: Create and evaluate descriptions and representations of scientific data via equations, graphs, tables, and/or models.

Moodle Privacy Statement

Please note that Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Courses using Moodle will make student information visible to other students in this class. Please remember that this information is protected by these

federal privacy laws and must not be shared with anyone outside the class. Questions can be referred to the Registrar's Office.

Federal Credit Hour Compliance Statement

Student work in this course is in full compliance with the federal definition of a four-credit hour course. Please see the Registrar's Office website (<https://registrar.lafayette.edu/wp-content/uploads/sites/193/2013/04/Federal-Credit-Hour-Policy-Web-Statement.doc>) for the full policy statement.

Generative Artificial Intelligence

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 out assigned homework problems on your own, or with help from other human beings such as your classmates and/or instructor.

PHYS 131 Course Outline (tentative) – Spring 2024

Week	Lecture	Date	Topic	Section	Homework
1	1	Jan. 22	Introduction	Ch. 1:1	
	2	Jan. 24	Units & Problem Solving	Ch. 1:2-6	
	3	Jan. 26	Working with Vectors	Ch. 1:7-9	
2	4	Jan. 29	Position, Velocity, and Acceleration	Ch. 2:1-3	PS 1 due
	5	Jan. 31	Motion with Constant Acceleration	Ch. 2:4	
	6	Feb. 2	Free Fall	Ch. 2:5-6	
3	7	Feb. 5	2D (Projectile) Motion	Ch. 3:1-3	PS 2 due
	8	Feb. 7	Projectile Motion Practice	Ch. 3:3	
	9	Feb. 9	Newton's Laws & Inertial Reference Frame	Ch. 4:1-2	
4	10	Feb. 12	Superposition & Free Body Diagrams	Ch. 4:3-4	PS 3 due
	11	Feb. 14	Action/Reaction & Friction	Ch. 4:5, 5:3	
	12	Feb. 16	Ramps & Pullies	Ch. 5:2	
5	13	Feb. 19	Circular Motion	Ch. 3:4, 9:1-2	PS 4 due
	14	Feb. 21	Circular Motion Applications	Ch. 5:4	
		Feb. 23	Exam I	Chs. 1-5	
6	15	Feb. 26	Work & Kinetic Energy	Ch. 6:1-3	PS 5 due
	16	Feb. 28	Work & Power	Ch. 6:4	
	17	Mar. 1	Gravitational & Elastic Potential Energy	Ch. 7:1-2	

7	18 19 20	Mar. 4 Mar. 6 Mar. 8	Forces & Potential Energy Momentum Inelastic Collisions	Ch. 7:3-4 Ch. 8:1-2 Ch. 8:3	PS 6 due
		Mar. 11 Mar. 13 Mar. 15	Spring Break		
8	21 22 23	Mar. 18 Mar. 20 Mar. 22	Elastic Collisions Center of Mass Rotational Kinematics	Ch. 8:4 Ch. 8:5 Ch. 9:3	PS 7 due
9	24 25	Mar. 25 Mar. 27 Mar. 29	Rotational Energy & Moments of Inertia Torque Exam II	Ch. 9:4-5 Ch. 10:1-3 Chs. 6-8	PS 8 due
10	26 27 28	Apr. 1 Apr. 3 Apr. 5	Rotational Dynamics Angular Momentum Conservation of Angular Momentum	Ch. 10:3-4 Ch. 10:5 Ch. 10:6	PS 9 due
11	29 30 31	Apr. 8 Apr. 10 Apr. 12	Rotational Motion Practice Newton's Law of Gravity Kepler's Laws	Ch. 10 Ch. 13:1,3 Ch. 13:4-5	PS 10 due
12	32 33	Apr. 15 Apr. 17 Apr. 19	Simple Harmonic Motion Simple Pendulum Exam III	Ch. 14:1-3 Ch. 14:4-5 Chs. 9-10, 13	PS 11 due
13	34 35 36	Apr. 22 Apr. 24 Apr. 26	Damped Oscillator Wave Motion Wave Speed	Ch. 14:6-7 Ch. 15:1-3 Ch. 15:3-5	PS 12 due
14	37 38 39	Apr. 29 May 1 May 3	Superposition & Interference Standing Waves Beats & Doppler Effect	Ch. 15:6 Ch. 15:7-8 Ch. 16:7-8	PS 13 due

Final Examination: 20% of Final Grade
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