# PHYSICS 151 — COLLEGE PHYSICS I

## UH MANOA — Spring 2025 Semester

# Course Information & Policies

*updated: 13 Jan 2025*

**Lecture**
Sec. 1 (CRN 71071): MWF 9:30–10:20 a.m.
Sec. 2 (CRN 77198): MWF 10:30–11:20 a.m.
Physical Science Building (PSB or PHYSCI) Room 217 lecture hall
*You may attend either lecture hour, EXCEPT for Exams (attend your enrolled lecture)*

**Instructor**
Mr. Michael Nassir, nassir@hawaii.edu
Office: Watanabe Hall Rm. 426, (808) 956-2922

**Help Hours — Instructor**
*Schedule subject to change — check Laulima course site for latest schedule:*
Wed. & Fri., 1:00–3:00 p.m. in Watanabe Hall Rm. 426
Meetings at other times by appointment, or call office phone anytime: (808) 956-2922

**Help Sessions — Undergraduate Learning Assistants (LAs)**
Drop-in Help Sessions for any questions related to PHYS 151!
***Starts week #2 of semester.***
***Schedule & locations To Be Announced — check Laulima course site for schedule***

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### Class Materials — in Laulima "Resources" Tab/Tool:

- **Lecture slides** will be uploaded as PDFs shortly before each lecture.
- **Tutorials** (Sample Problems) and other handouts will be distributed on paper in lecture AND uploaded as PDFs.
- **Solutions to Tutorial Problems** will only be uploaded as PDFs.

### Textbook & Online Homework

**Young & Adams, *College Physics***, 11th ed. (2020), Chaps. 1–16 ("vol. 1" of paperback version)
**Mastering Physics —** online homework system linked to eBook & additional study resources

- All officially enrolled PHYS 151 students will be automatically charged an "IDAP fee" (approx. $63) near the start of the semester, directly to your UH student accounts. This provides access to both the eBook & Mastering Physics, initially through Laulima's "VitalSource for UH Manoa IDAP" tool/tab.
- *You should NOT purchase Mastering Physics access directly from Pearson with a credit card — that method costs much more than the IDAP fee.*
- Students can "opt out" of the IDAP fee by Feb. 5. However, online HW is worth 15% of your final class grade; students who do not have Mastering Physics access will forfeit those points.
- Paper formats of our textbook exist, but they are NOT stocked in the UH Bookstore:
  - Looseleaf (unbound & 3-hole-punched) — *usually least-expensive option*
  - Paperback (vol. 1 & vol. 2 sold separately)
  - Hardcover (full text)

  If you wish, please purchase through a third-party bookseller, or through the Mastering Physics website (cheapest route for "Looseleaf" version), or directly from Pearson:
  https://www.pearson.com/store/p/college-physics/P100002458383
- Young & Adams *College Physics* 11th ed. is currently used by all PHYS 151 & 152 classes at UH Manoa during all terms, including Summer Session.

### Scientific Calculator

- Necessary and expected for homework, problem sets & exams!
- Should include scientific notation (power-of-10) notation, trigonometric functions, exponents & logarithms.
- Graphing or programmable calculators are allowed, but NOT necessary.
- ***Smart phones, tablets, computers, or similar devices are NOT permitted during exams.*** If your calculator has internet capability, you must disable it during our exams.

## PHYS 151 Course Description

This course is the first half of a two-semester introduction to the fundamental concepts, laws, and formulas of physics. PHYS 151 covers mechanics (kinematics, dynamics, gravitation, energy, momentum, rotation, oscillations & waves), and some basic thermodynamics. Lectures and problem-solving will regularly use the mathematical tools of algebra, geometry, trigonometry, and vectors, but *not* calculus.

### Math Prerequisite

*Required:* Grade of "C" or better in **MATH 140 (Trigonometry & Pre-calculus) or MATH 215 (Applied Calculus I) or higher**. Students can also qualify via a passing score on the UH Manoa Mathematics Department's Placement Exam: Level 2 or higher (≥14 correct on Part I, and ≥10 correct on Part II).

We expect students to enter PHYS 151 lecture equipped with good facility in geometry, advanced algebra (including exponents & logarithms), and trigonometry. We use these mathematical tools extensively right from the start of PHYS 151 without reviewing them, so if you are not confident about your math skills in those areas, please review them before attempting this course. Please see Chap. 0 of our textbook for a summary of math topics you should be familiar with.

### PHYS 151L Lab

• If you plan to take PHYS 151L lab, we recommend that you do so concurrently with the lecture — the lab provides a hands-on way of reinforcing and complementing many of the topics presented in lecture. However, we do *not* require concurrent enrollment in PHYS 151L lab with PHYS 151 lecture; you can instead take PHYS 151L lab in a future term, or not at all.

• **Our PHYS 151 lecture and PHYS 151L lab courses are run and graded completely separately.** None of the points or assignments for lecture count toward the lab, or vice versa.

• The supervising professor for our introductory lab classes is Dr. Philip von Doetinchem. Please see his PHYS Lab master webpage for much more information, including syllabi and contact information for individual lab sections & TAs:

https://www.phys.hawaii.edu/~philipvd/25_spring_intro_labs_uhm.html

• Lab TA names & contact information will appear on the above webpage toward the end of the first week of the semester.

• **Our introductory PHYS Lab classes do NOT meet during the first week of the semester. PHYS 151L Lab classes will begin on Tues. Jan. 21, 2025.** (Monday lab classes will have their first meeting on Mon. Jan. 27.)

## PHYS 151 Learning Outcomes — General

Upon successful completion of this course, students should be able to:

- Define and use the terminology of mechanics, waves, fluids, and simple thermodynamics.
- Apply the equations and principles of non-calculus-based physics to solve a wide range of problems in mechanics, waves, fluids, and simple thermodynamics.
- Recognize where and how these physical principles apply to natural phenomena, problems and professional settings within other scientific fields, and technology and situations encountered in daily life.

## PHYS 151 Learning Outcomes — Detailed

Upon successful completion of this course, students should be able to:

- Describe the instantaneous and average relationships among position, velocity, and acceleration; construct and interpret graphs of all three; and calculate all three for the special case of constant acceleration.
- Identify vector vs. scalar quantities; convert two-dimensional vectors between magnitude & direction and Cartesian components; perform scalar multiplication and addition of vectors.
- Describe the nature of force and the meaning and implications of Newton's Three Laws of Motion.
- Apply Newton's $2^{nd}$ Law to calculate the dynamics of systems for the special case of constant net force (including static equilibrium), including systems with ideal springs, contact friction, inclined planes, cables/pulleys, and uniform circular motion.
- Apply Newton's Law of Universal Gravitation to calculate the dynamics of simple systems of masses.
- Apply Kepler's Laws of Planetary Motion to describe and calculate the properties of simple orbits.

- Describe and calculate various forms of energy, including mechanical work, kinetic energy, and potential energies.
- Explain the Law of Conservation of Energy and its relationship to conservative vs. non-conservative forces.
- Apply Conservation of Energy to calculate kinematic quantities of a system, and identify where it is appropriate to do so.
- Describe the relationship between force and impulse/momentum, and apply it to calculate kinematic quantities of appropriate situations.
- Explain the Law of Conservation of Linear Momentum and its relationship to elastic vs. inelastic collisions.
- Apply Conservation of Momentum to calculate kinematic quantities of a system, and identify where it is appropriate to do so.
- Describe the analogy between rotational and translational kinematic & dynamic quantities, formulas, and conservation laws; apply them separately and in concert to calculate kinematic & dynamic quantities of rotating systems.
- Define density and pressure; apply them and related formulas to calculate physical properties of a variety of fluid-mechanical situations, including hydrostatics, buoyancy, and systems of confined fluid flow (Bernoulli's Equation and Continuity Equation).
- Describe the kinematics and energy conservation of simple harmonic motion, give examples of relevant physical systems, and calculate their kinematic/dynamic properties.
- Explain the nature of waves and the phenomena of wave motion, superposition & interference, reflection, and formation of one-dimensional standing-wave modes.
- State the mathematical relationships that govern wave propagation, superposition, standing-wave modes, beats, and the Doppler Effect, and apply them to calculate related physical quantities.
- Describe the phases/states of matter; explain the kinetic basis of temperature, forms of internal energy, and the primary modes of heat/energy transport.
- Employ mathematical definitions of specific heat capacity and latent heat to quantitatively relate heat to changes in temperature.
- Describe broadly the kinetic theory of gases; apply the Ideal Gas Law (and its related forms) to calculate thermodynamic quantities related to various transformations of a confined gas; find the work performed during isobaric expansion/contraction.
- Describe the broad meaning and implications of the 1st Law of Thermodynamics, and apply it quantitatively to ideal gas transformations.
- Explain the simple model of a heat engine and the quantitative relationship between efficiency, inputs & outputs, and Carnot temperatures.
- Qualitatively and quantitatively define changes in entropy; describe the broad meaning and implications of the 2nd Law of Thermodynamics.

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## Course Grades

### Weighting of Assignments & Exams

Each student's **overall course percentage (OCP)** will be computed as follows:

| |
|---|
| **Top 3 of 4 Midterm Exam percentages — weighted 17% each** |
| **Final Exam percentage — weighted 34%** |
| **Online Homework percentage — weighted 15%** |

**Formula to calculate OCP:**

- Convert all raw point-scores into percentages:
  - Midterm 1 Exam percentage = (points earned) / (points possible)
  - Midterm 2 Exam percentage = (points earned) / (points possible)
  - Midterm 3 Exam percentage = (points earned) / (points possible)
  - Midterm 4 Exam percentage = (points earned) / (points possible)
  - Final Exam percentage = (points earned) / (points possible)
  - Total Online HW percentage = (total points earned) / (total points possible)
- Discard one lowest Midterm Exam percentage.
- Calculate overall course percentage (OCP):

  OCP = (best Midterm percentage)×(0.17) + (second-best Midterm percentage) ×(0.17)
  + (third-best Midterm percentage)×(0.17) + (Final Exam percentage)×(0.34)
  + (Total Online HW percentage)×(0.15)
- Convert OCP to corresponding letter grade according to table below.

### Final Letter-Grades

**Minimum overall course percentage (OCP) cutoffs for final letter-grades:**

| | | | |
|---|---|---|---|
| 93.0% A+ | 75.0% B+ | 60.0% C+ | 47.0% D+ |
| 85.0% A | 70.0% B | 55.0% C | 43.0% D |
| 80.0% A– | 65.0% B– | 50.0% C– | 40.0% D– |

**"Curving":**

- Curves will NOT be applied to individual exam scores/percentages.
- As final letter grades are assigned at the end of the semester, **OCP cutoffs for some letter-grades might be lowered at the instructor's discretion** (thereby improving the final letter-grades), but they will not be raised.

**Rounding:**

- OCPs will be **rounded to the nearest 0.1%** before assigning letter grades. Examples:
  - OCP = 79.950% rounds to 80.0% ⟶ A–
  - OCP = 79.949% rounds to 79.9% ⟶ B+
- **Exceptions to this rounding rule will <u>NOT</u> be granted**, so please do not request them.

## Exams

### Exam Dates & Topics

| | | |
|---|---|---|
| Midterm #1 | **Mon. Feb. 10** | **Lectures #1–9** ≈ *assigned sections of Chaps. 1–2* |
| Midterm #2 | **Mon. Mar. 3** | **Lectures #10–15** ≈ *assigned sections of Chaps. 3–5* |
| Midterm #3 | **Mon. Mar. 31** | **Lectures #16–24** ≈ *assigned sections of Chaps. 6–8* |
| Midterm #4 | **Mon. Apr. 21** | **Lectures #25–30** ≈ *assigned sections of Chaps. 9–10, 13* |
| Final Exam | **Mon. May 12, <u>9:45–11:45am</u> for Lecture Sec. 2 (MWF 10:30am class)** | |
| | **Fri. May 16, <u>9:45–11:45am</u> for Lecture Sec. 1 (MWF 9:30am class)** | |

**Cumulative review, with emphasis on Lectures #31–40** ≈ *assigned sections of Chaps. 11–12, 14–16*

• **Plan to attend your officially registered lecture section (9:30am or 10:30am) on all Exam dates,** unless otherwise invited by your instructor.

• All exams will have **entirely multiple-choice questions**, scored via Scantron forms (bubble sheets).

• **Sample exam problems** will be provided before most exams. The sample questions will be similar to, but NOT identical to, your actual exam problems. The sample questions may not cover all of the topics of your actual exam.

### Midterm Exams

• **Four Midterm Exams** will test you on material from every few weeks of the course.
• Midterms are **50 minutes long**, held during our regular class meeting times.
• Each Midterm will contain roughly 25–40 multiple-choice questions, worth either 1 or 2 points each. Some questions will be purely conceptual, while others will require numerical calculation.

• Each Midterm Exam will be worth the **same weight** toward your overall course percentage and final letter grade.
• **ONE lowest Midterm Exam score (percentage) will be automatically dropped** for each student.

• **<u>NO EARLY or MAKE-UP MIDTERM EXAMS ARE AVAILABLE</u>.** If you miss a Midterm Exam, that score of zero is eligible to become your one dropped Midterm score.

### Final Exam

• A **Final Exam** will cumulatively test all previous course material, although it will emphasize newest material from the last few weeks of the course.
• The **120-minute** Final Exam will have roughly twice as many questions as a single Midterm Exam, and it carries a greater weight toward your overall course grade.

• If classroom space permits, students might have the option to switch between the Monday and Friday Final Exam dates. Please watch for an announcement about this during the last month of the semester.

### Scantron Bubble Sheets & Pencils

– Your instructor will provide you with Scantron bubble-sheets for your multiple-choice answers — you do not need to purchase or bring your own Scantron sheets.

– Please **bring your own favorite No.2/HB (or softer) pencils and erasers**. Extra No.2 pencils will also be available in class on exam days. **<u>Do NOT use pen</u>** to fill in Scantron bubbles!

## Exam Note-Sheets

– You are allowed to bring **ONE sheet of <u>handwritten</u> notes** to Midterms #1 & #2.
– You can bring **TWO sheets of <u>handwritten</u> notes** to Midterms #3 & #4 and the Final Exam.

– Pages must be no larger than 8.5×11 inches (standard U.S. Letter size).
– You can use BOTH sides of each sheet.
– You can retain your note-sheets after each exam, to build upon for later exams.

– **Paper printouts of handwritten notes from your computer tablet are allowed ONLY if you wrote the notes yourself.** Such printouts must clearly appear to be home-made and handwritten when inspected by your instructor; otherwise, they will be confiscated, and you will be penalized. Such printouts are subject to the same page limits & dimensions listed above.

– *Advice:* Do NOT let these note-sheets become a substitute for learning formulas and practicing problems! (Graduate-school exams like the MCAT do NOT allow open notes — you must memorize your formulas.)

## Exam Restrictions

**<u>FORBIDDEN</u> during all exams:**

✖ **Any <u>non-handwritten materials</u>**. This includes any printed or photocopied excerpts from books, websites, study guides, lecture slides, course handouts, or anything else that is not your own handwritten or hand-drawn creation.

✖ **Smart phones, tablets, computers, or similar devices.**

✖ **Internet access.**

✖ **Collaboration** with other people, or **other forms of real-time outside assistance** (such as AI systems). Exams must reflect and contain only your own personal work and effort.

## Scientific Calculators

– **Bring your own scientific calculator with trigonometric & exponential functions to every exam.** Exam questions are written with the expectation that all students will have scientific calculators with these capabilities.

– Graphing capability is allowed, but it is not necessary or expected.

– **Internet access is NOT allowed during exams.** If your calculator has this capability, you must disable it during our exams.
– **Phones, tablets, computers, or similar devices are NOT allowed during exams.** They CANNOT be used as calculators during exams.

– *Advice:* Use the same calculator with your homework problems as you plan to use during our exams. This will allow you to gain speed and proficiency with its features.

## Online Homework in Mastering Physics

• **Online HW assignment numbers match Lecture numbers & Tutorial numbers that cover the same topics.**

• **Assignments will be due most Tuesdays and Fridays at 11:55 pm HST, starting in Week #2 of the semester.**

• Assignments vary widely in length and point-values. Sometimes, **two assignments may be due on the same date**.

• Each assignment will usually be posted roughly a week before it is due. Please re-check Mastering Physics regularly for new assignments and due dates.

### Points

– Point values for each problem are based on difficulty, number of parts, time required, and importance. If a problem has multiple parts, Mastering Physics divides the problem's total point-value evenly between the parts, even if the parts vary in difficulty.

– Homework points (and time required) vary widely from assignment to assignment.

– Online HW points will be simply added together to form a grand total for the entire semester. This grand total will be divided by the total possible HW points to calculate your Online HW Percentage.

– Note that percentages earned on individual HW assignments do not matter; only your grand total of earned HW *points* over the entire semester matters.

### Penalties

*This should match the Grading Policy that can be viewed in Mastering Physics:*

**Lateness: Minus 20% per day** past the due date/time, **decreasing gradually to zero credit at 5.0 days**. This penalty is prorated for fractions of day (i.e., 2 hours late ⇒ –1.7% penalty). This penalty is applied ONLY to individual late problems, not to the entire assignment's score.

**Wrong Answers – Multiple-Choice Questions:** Fractional penalty for every wrong answer, decreasing to zero credit when only one choice remains.

**Wrong Answers – Free-Response Questions (numerical entry, etc.):** No penalty for first 10 wrong attempts, then question is forfeit (no credit).

### Due-Date Extensions

**NO EXTENSIONS to Online Homework due dates will be granted for ANY REASON.**
Online HW assignments are normally available for many days **before** and after each deadline; the penalty for any late problems is very slow-acting; and late penalties narrowly apply only to the individual late problems, not to entire assignments. This policy is intended to automatically cover any lateness caused by short-term circumstances beyond your control: personal emergencies, illnesses, broken computers, internet outages, etc. **If you complete your remaining late problems soon afterward, they will still be worth very substantial credit.**

### Extra-Credit Questions

Some Online HW assignments contain **one or two problems worth a small amount of extra credit** — those problems should be labeled as such in Mastering Physics. Those particular assignments therefore have a maximum possible score slightly greater than 100%.

Extra-credit problems are either slightly more challenging than others, or they provide redundant extra practice on skills from the other problems. Either way, extra-credit problems typically require greater-than-average work for less-than-average points, so you should perform them only if your time and interest permit.

### Repeating Completed Problems for Practice

Any of our assigned Mastering Physics problems that are either completed or expired (>5 days past due date) should remain fully accessible to you as long as you have access to our Mastering Physics site. **All problems should be repeatable as zero-credit "practice" problems** — look for a button near each problem labeled "Repeat for Practice."

### Optional Non-Credit Assignments

Any Mastering Physics assignments or problems that are labeled "NOT FOR CREDIT" are purely optional. They are NOT worth any points toward your Online HW point-total, and their point-values should appear as zero in Mastering Physics.

## Tutorials (Sample Problems), Textbook Readings & Additional Practice

• **Tutorials (Sample Problems)** will be distributed on paper in lecture AND posted online as PDFs in Laulima's Resources tool/tab. Full worked **Solutions** for each Tutorial will be posted as PDFs in Laulima's Resources.

- Some Tutorial questions will be used as examples in each lecture; remaining questions are for optional practice on your own.
- Tutorial problems are NOT for credit and do NOT need to be turned in.
- **Tutorial numbers correlate with Lecture numbers & Online HW numbers** that cover the same topics.

• **Textbook reading assignments (section numbers)** are listed in the attached course calendar, and are also repeated near the start of each tutorial sheet. These are the sections of our text that will be covered in lecture, and which you will be responsible to know for exams. Lectures will highlight most of the important formulas, concepts, and vocabulary, and show a few examples of their applications. Our textbook is valuable because it contains additional worked example problems beyond those of our lectures and tutorials.

• **How to use our textbook:** I recommend using our textbook like a reference manual or cookbook, instead of reading it start-to-finish like a novel. Suggested method:

- Skim the relevant textbook sections in advance of their related lecture, then go back and review more carefully after lecture.
- When first skimming a section to orient yourself to a topic, skip long text passages or mathematical derivations. Instead, pay most attention to headers, **highlighted or boxed formulas**, important-looking diagrams & tables, and the gist of any worked examples.
- **End-of-chapter summaries** are extremely useful one-page distillations of the essential formulas and topics — often, those are all you need to refer to when working on homework problems.

• **eBook:** There are multiple ways to access our eBook (Young & Adams, *College Physics* 11th ed., with image of sailboat on cover):

*Via Laulima PHYS 151 webpage:*
– Click the "VitalSource for UH Manoa IDAP" tool/tab
– When you see the image of our textbook, click on green "Read Now" button

*Via Mastering Physics:*
– Click the "Pearson eText" tab along the left-hand side of our MP course page
*OR:*
– Follow the "Study Area" tab along the left-hand side of our course page
*OR:*
– Hyperlinks that open relevant portions of the eBook are located throughout MP homework problems and study resources.

• **"Study Area" in Mastering Physics:** Click on the "Study Area" tab along the left-hand side of our course page. After it launches, you will see links to the eBook, Videos, Chapter quizzes, online Physics simulations, and more. I encourage you to explore this and use it to enhance each of our topics.

• **End-of-Chapter Problems:** Solving physics problems is a skill learned through repeated practice, similar to learning a sport or musical instrument. To truly gain proficiency, **I recommend that you attempt as many additional end-of-chapter problems as your time permits.** Answers to all odd-numbered end-of-chapter problems are located in the textbook's Appendix (called "Backmatter" in the eBook).

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## Solving Physics Problems & “Showing Your Work”

**This semester, you will NOT be asked to submit detailed work for Online HW or Exams. However, the following is general good practice for solving physics problems, so please follow it whenever possible:**

It is a central notion in science to **show your method** along with your results, so that others can follow your reasoning and can question any steps or assumptions. Also, clear and complete work will help you later as you review your own work and study for exams. It is never possible to “show too much work,” but it is easy not to show enough!

- Write out all **major mathematical steps** from your **initial formula(s)** to **your final answer.** (Minor algebraic steps and arithmetic calculations can be omitted.) Your lines of mathematical work should read **sequentially and logically**.
- Accompany your math with **sketches**, **diagrams**, and **short written phrases or comments,** where appropriate. Whenever you introduce a new quantity, like an angle or length, create a simple, neat diagram that clearly shows what the variable represents!
- All numerical values should include **units**.
- Very large and very small values should be written in **scientific (power-of-10) notation**.
- Final numerical answers should be **fully calculated and simplified**, then expressed as a decimal value rounded to an appropriate number of **significant figures**. It is rarely appropriate to leave your final answer to a physics problem as a fraction, square-root, or other un-rounded value, or in any un-simplified algebraic form.

In summary, “showing your work” should include:

1. **Initial Formula(s)**, followed by major algebraic rearrangement steps (if necessary)
2. **Substitution**: show all “plugged in” numerical values, followed by major calculation steps (if necessary)
3. **Final Answer**: underlined or boxed, with **proper units**, **sci. notation** (if needed), & **proper significant figures**
4. **Diagrams or comments** as needed to define quantities or explain work. (A picture is worth $10^3$ words!)

Finally, **organization and neatness matter**! Both should result naturally if you follow the above steps. Disorganized or illegible work can lead to both mathematical and conceptual errors.

## Getting Help with Physics

*The following resources are all free-of-charge to current UH Manoa students:*

**• PHYS 151 Undergraduate Learning Assistants (LAs): — *Starting week #2 of semester***
~15 hours/week of drop-in Help Hours for assistance with homework questions or anything else related to PHYS 151. ***Days/times and locations To Be Announced — please see our Laulima course site for current schedule.***

**• Physics Lab TAs in Watanabe 421 — *Starting week #2 of semester***
Our Physics Lab TAs (mostly graduate students in Physics) hold ~30 hours/week of drop-in office hours in Watanabe Hall Rm. 421 (Physics Library & Study Center). Look for someone with a "Physics TA/Tutor" nameplate on the table near them.

Although lab TAs *must give first priority to students with lab-related questions*, they can also assist with lecture homework problems or other physics questions as time permits. The current master schedule with all TA names/days/hours is posted on the Introductory Physics Labs master website:
**https://www.phys.hawaii.edu/~philipvd/25_spring_intro_labs_uhm.html**

**• College of Natural Sciences Learning Emporium in Bilger Addition 209**
The CNS Learning Emporium is open daily for drop-in assistance with lower-division math & science classes. Some subjects also offer remote tutoring via Zoom or Discord. Current tutoring schedules for Physics and other STEM subjects are posted online:
**https://natsci.manoa.hawaii.edu/learningemporium/**

**• Academic Resource Center** (formerly Sinclair Library's Learning Assistance Center)
**https://manoa.hawaii.edu/undergrad/Learning/**

- One-on-one tutoring for physics and many other introductory subjects, in Agricultural Engineering Institute building (formerly in Sinclair Library). Requires appointment via website at least 24 hours in advance; walk-in tutoring available during finals week only.
- Drop-in assistance for some introductory math & science subjects in the Hale Aloha Cafe (also known as Housing Success Center (HSC)), Sunday–Thursday evenings, 6:00–9:00pm. See schedule on website for subjects covered.
- Discord-based assistance for many introductory subjects

**• Online Learning Academy (OLA)**
Free Zoom-based tutoring is available for grades 6-12 & college-level physics, math, chemistry and biology.
Sunday 5:00–8:00pm & Monday–Thursday 6:00–9:00pm:
**http://manoa.hawaii.edu/ola/math-science-college/**

# PHYS 151 Spring 2025 Calendar of Topics & Textbook Sections

*Updated: 13 Jan 2025*

• This is an intended schedule of topics, but actual subject matter covered by each date may lag behind. In that case, **exams will only include material actually covered in lecture before each exam date. Relevant topics will be confirmed before each exam.**
• For sections/topics listed below in regular type, you will be expected to know and understand the major formulas, concepts, and terminology, and how to apply them correctly to basic and intermediate-level problems.
• For sections/topics listed in *[[brackets]]*, you only need to familiarize yourself *qualitatively* with the concepts and terminology. For these sections, you do NOT need to learn any specific formulas, nor will you be asked to solve any numerical problems for those topics.

| DATE | EVENT | READ: Young & Adams, *College Physics*, $11^{th}$ ed. |
|---|---|---|
| M Jan 13 | Lecture #1 | Intro to PHYS 151<br>*[[§1.1–1.2: Intro to Physical Laws & Models]]*<br>Chap. 0: Math Review *(self-review, not in lecture)*<br>§0.1–0.2: Powers-of-10 & Scientific Notation |
| W Jan 15 | Lecture #2 | §1.3–1.4: SI/Metric Units & Prefixes; Unit Conversions<br>§1.5: Uncertainty & Significant Figures<br>*[[§1.6: Estimates & Orders of Magnitude]]* |
| F Jan 17 | Lecture #3 | §2.1–2.2: Position & Displacement, Speed & Velocity |
| (M Jan 20) | HOLIDAY | *MLK Jr. Day* |
| W Jan 22 | Lecture #4 | §2.1–2.2: Graphing Position & Velocity |
| F Jan 24 | Lecture #5 | §2.3: Acceleration; Graphing Acceleration |
| M Jan 27 | Lecture#6 | §2.4–2.5: Kinematics with Constant Acceleration |
| W Jan 29 | Lecture #7 | §2.6: Freefall |
| F Jan 31 | Lecture #8 | §1.7–1.8: Vectors vs. Scalars, Vector Notation, Vector Components |
| M Feb 3 | Lecture #9 | §1.7–1.8: Vector Arithmetic: Scalar Multiplication, Addition/Subtraction |
| W Feb 5 | Lecture #10 | §2.7, 3.5: Relative Velocity, Adding Velocities in 1-D & 2-D<br>§3.1–3.2: 2-D Kinematics |
| F Feb 7 | Lecture #11 | §3.3: Projectile Motion |
| **M Feb 10** | **MIDTERM #1** | **Lectures #1–9** ≈ *assigned sections of Chaps. 1–2* |
| W Feb 12 | Lecture #12 | §4.1–4.6: Common Forces, Newton's Laws of Motion, Free-body Diagrams |
| F Feb 14 | Lecture #13 | §5.1–5.2: Applying Newton's $2^{nd}$ Law: 1-D & 2-D Dynamics & Equilibrium |
| (M Feb 17) | HOLIDAY | *Presidents Day* |
| W Feb 19 | Lecture #13 continued | §5.1–5.2: Applying Newton's $2^{nd}$ Law: 1-D & 2-D Dynamics & Equilibrium |
| F Feb 21 | Lecture #14 | §5.4 & 11.2: Elastic Force: Ideal Springs & Hooke's Law<br>*[[§11.1: Stress & Strain; Elasticity vs. Plasticity]]*<br>§5.3: Force of Surface Friction (Kinetic & Static)<br>*[[§5.3: Fluid Drag]]* |
| M Feb 24 | Lecture #15 | §5.2–5.3: Applying Newton's $2^{nd}$ Law: Inclines<br>*not in textbook*: Simple Machines & Mechanical Advantage<br>§5.5: Four Fundamental Forces of Nature |
| W Feb 26 | Lecture #16 | §11.2: Period, Frequency & Angular Frequency<br>§3.4, 6.1: Uniform Circular Motion, Centripetal Acceleration & Force<br>*[[§6.2: Motion in a Vertical Circle]]* |
| F Feb 28 | Lecture #17 | §6.3: Newton's Law of Universal Gravitation<br>§6.4: Weight & Surface Gravity |
| **M Mar 3** | **MIDTERM #2** | **Lectures #10–15** ≈ *assigned sections of Chaps. 3–5* |
| W Mar 5 | Lecture #18 | §6.5: Orbits<br>*not in textbook:* Kepler's Laws of Planetary Motion |
| F Mar 7 | Lecture #19 | §7.1–7.3: Energy, Work, Work-Energy Theorem<br>§7.8: Power |
| M Mar 10<br>**video** | Lecture #20 &<br>Lecture #21 | §7.5: Gravitational Potential Energy<br>§7.4–7.5: Elastic Potential Energy<br>§7.7: Conservative vs. Non-conservative Forces<br>§7.6: Conservation of Energy |
| W Mar 12<br>**video** | Lecture #22 | §8.1, 8.5: Momentum & Impulse |

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| F Mar 14<br>**video** | Lecture #23 | §8.2: Conservation of Momentum<br>§8.3–8.4: Elastic vs. Inelastic 1-D Collisions<br>*[[§8.8: Rocket Propulsion]]* |
| (Mar 17-21) | NO CLASSES | *Spring Break* |
| M Mar 24 | Lecture #24 | §8.6-8.7: Center of Mass, Velocity of CM |
| (W Mar 26) | HOLIDAY | *Kuhio Day* |
| F Mar 28 | Lecture #25 | §9.1–9.3: Rotational Kinematics<br>§9.4: Moment of Inertia, Rotational Kinetic Energy<br>§9.5: Rolling Objects |
| **M Mar 31** | **MIDTERM #3** | **Lectures #16–24** ≈ *assigned sections of Chaps. 6–8* |
| W Apr 2 | Lecture #26 | §10.1: Torque<br>§10.2: Rotational Dynamics<br>§10.3: Rotational Work<br>§10.6: Static Equilibrium & Stability, Mechanical Advantage of Levers |
| F Apr 4 | Lecture #27 | §10.4–10.5: Angular Momentum; Conservation of Ang. Mom.<br>§10.7: Vector Nature of Angular Quantities<br>*[[§10.7: Gyroscopes & Precession]]* |
| M Apr 7 | Lecture #28 | §13.1: Density<br>§13.2: Pressure, Pascal's Principle, Hydrostatic Pressure Increase with Depth |
| W Apr 9 | Lecture #29 | §13.3: Archimedes' Principle & Buoyancy |
| F Apr 11 | Lecture #30 | §13.5: Flowing Fluids: Continuity Equation<br>§13.6–13.8: Flowing Fluids: Bernoulli's Equation & Principle |
| M Apr 14 | Lecture #31 | §11.2–11.4: Simple Harmonic Motion & Energy Conservation |
| W Apr 16 | Lecture #32 | §11.5: Simple Pendulums<br>*[[§11.6: Damped Oscillations, Driven Oscillations, Resonance]]* |
| (F Apr 18) | HOLIDAY | *Good Friday* |
| **M Apr 21** | **MIDTERM #4** | **Lectures #25–30** ≈ *assigned sections of Chaps. 9–10, 13* |
| W Apr 23 | Lecture #33 | §12.1, 12.3: Mechanical Waves & Wave Speeds<br>§12.2: Continuous Waves<br>*[[§12.4: Mathematical Description of Continuous Waves]]*<br>§12.9, 12.13–12.14: Sound Waves & Hearing<br>§12.5: Reflection & Transmission |
| F Apr 25 | Lecture #34 | §12.5: Principle of Superposition<br>§12.8: Constructive & Destructive Interference §12.11: Beats<br>§12.6: Transverse Standing-Wave Modes (Normal Modes) on a String |
| M Apr 28 | Lecture #35 | §12.7: Longitudinal Standing-Wave Modes (Normal Modes) in Air Columns<br>§12.12: Doppler Effect & Shock Fronts<br>§12.10: Wave Energy & Intensity, Decibel Scale of Loudness |
| W Apr 30 | Lecture #36 | §14.1–14.2: Temperature<br>*[[§16.8: Absolute Zero]]*<br>§14.3: Thermal Expansion of Solids & Liquids<br>§14.4: Heat; Heat Capacity & Specific Heat |
| F May 2 | Lecture #37 | §14.1–14.2: Thermal Equilibrium<br>§14.7: Heat/Energy Transfer Methods: Conduction, Convection, Radiation<br>§15.2: *PT* Phase Diagrams<br>§14.5–14.6: Latent Heat & Phase Transitions |
| M May 5 | Lecture #38 | §15.1–15.2: Equations of State, Ideal Gas Law<br>§15.3–15.4: Kinetic Theory of Gases, Maxwell-Boltzmann Distributions |
| W May 7 | Lecture #39 | §15.5: 1st Law of Thermodynamics<br>§15.5: Work Done by/on a Gas, *PV* Diagrams<br>§15.6–15.7: Constant-Value & Adiabatic Thermodynamic Processes |
| also<br>W May 7 | Lecture #40 | §16.1–16.2: Reversible Processes & Heat Engines<br>*[[§16.3–16.4: Combustion Engines & Refrigerators]]*<br>*[[§16.9: Efficiencies of Real-World Processes]]*<br>§16.5–16.6: 2nd Law of Thermodynamics, Carnot Engines §16.7: Entropy |
| **M May12 or**<br>**F May 16**<br>**9:45-11:45a** | **FINAL EXAM** | **9:45-11:45am: Mon May 12** (Sec. 2 Lecture) **OR Fri May 16** (Sec. 1 Lecture)<br>**Cumulative, with emphasis on Lectures #31–40** ≈ *assigned sections of Chaps. 11–12, 14–16* |