PHYSICS 151 — COLLEGE PHYSICS I
UH MANOA — Spring 2021 Semester

Course Information & Policies
updated: 29 Jan 2020

Due to the ongoing pandemic and our trials of new remote-teaching tools and methods,
PORTIONS OF THIS SYLLABUS MAY CHANGE during the semester.
Any substantive changes will also be announced via e-mail. Thank you in advance for your patience and flexibility.

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

Zoom "Office" Hours: Mon. 9:30-11:30am & Fri. 3:00pm–5:00pm, or other times by appointment

PHYS 151 Learning Assistants
Schedule of weekly Zoom Help Sessions: https://tinyurl.com/Phys151Spr21LASchedule

PHYS 151 Zoom Address
Meeting ID: **413-810-7726**
OR Use this link to launch Zoom & join meeting: https://hawaii.zoom.us/j/4138107726
Passcode: **EmcSquared**

Asynchronous Lectures
- View videos, slides, and practice problems at your convenience.
- New materials will be posted continuously during the semester.
- See Calendar section below for suggested pacing.

Synchronous Exams
- Exams will be administered via Laulima (NOT Zoom) at the following days/times:
  Midterms: 10:30–11:30am on Mondays 2/8, 3/1, 3/29, and 4/19
  Final Exam: 9:45–11:45am on Monday 5/10
- See "Exams" section below for more details.

Synchronous Weekly Discussion Sessions by Section
- Synchronous sessions via Zoom with Learning Assistants (LAs) and up to 20 students.
- Attendance is required to receive credit on accompanying problem sets.
- See "Discussion Sessions & Problem Sets" section below for more details.

Course Materials — Google Drive Folder
Most lecture content (slides & videos, tutorial sample problems & solutions, other handouts) will be gradually posted throughout the semester here for viewing or download: To access this folder, first ***log in to Google with your hawaii.edu account***:
https://tinyurl.com/phys151spr2021

Required Course Materials — Textbook & Online Homework
Young & Adams, *College Physics*, 11th ed. (2020), Chaps. 1–16 (vol. 1)
Mastering Physics — online homework system linked to eBook (Young & Adams) & additional study resources
- eBook & Mastering Physics — approx. $60 automatic "IDAP" charge to your student account around Tue. Feb. 2, unless you "opt-out" beforehand. *See separate handout for access instructions and additional details.*
- Looseleaf version (unbound, 3-hole-punched): Discounted price of $45 through Mastering Physics (anytime) or approx. $20 through UH Bookstore (only after Feb. 2).
- Paperback (vol. 1) or Hardcover: No discounted prices offered. Not stocked in UH Bookstore, so purchase through outside sellers, or directly from Pearson (full price):
  https://www.pearson.com/store/p/college-physics/P100002458383

Recommended Course Materials — Scientific Calculator

- Should include scientific notation (power-of-10) notation, trigonometric functions, exponents & logarithms.
- Necessary and expected for exams and homework.
- Graphing or programmable calculators are allowed, but NOT necessary.

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), waves, and thermodynamics. Lectures and problem-solving will regularly use the mathematical tools of algebra, geometry, trigonometry, and vectors, but *not* calculus.

Prerequisite: Grade of "C" or better in **MATH 140 (trigonometry & pre-calculus) or MATH 215 or higher**; or instead, a passing score on the Mathematics Department's Math Placement Exam (≥14 on Part I & ≥10 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.

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

https://www.phys.hawaii.edu/~philipvd/21_spring_intro_labs_uhm.html

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 1^{st} 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 2^{nd} Law of Thermodynamics.

Course Grades

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

Top 4 of 5 Exam percentages (4 Midterm Exams & Final Exam) — 15% each
Online Homework percentage — 30%
Discussion Session Problem Set percentage — 10%

Final letter-grade cutoffs for overall course percentage:

95.0% A+	80.0% B+	65.0% C+	50.0% D+
90.0% A	75.0% B	60.0% C	45.0% D
85.0% A–	70.0% B–	55.0% C–	40.0% D–

At the end of the semester, these cutoffs may be lowered at the instructor's discretion, but they will not be raised.

Students can calculate their course letter grade at any time using the following method:

- Convert all point-scores into percentages:
  - Total Online HW percentage = (total points earned) / (total points possible)
  - Each Discussion Session Problem Set percentage = (points earned) / (points possible)
  - 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)
- Discard one lowest Exam percentage.
- Discard two lowest Discussion Problem Set percentages, then average together all remaining Discussion Problem Set percentages.
- Calculate overall course percentage (OCP):
  - OCP = (best exam percentage)×(0.15) + (second-best exam percentage) ×(0.15)
    + (third-best exam percentage)×(0.15) + (fourth-best exam percentage)×(0.15)
    + (Total Online HW percentage)×(0.30) + (Discussion Problem Set Average)×(0.10)
- Convert OCP to corresponding letter grade according to above table.

Exams

• **Four Midterm Exams** will test you on material from every few weeks of the course.
• A **Final Exam** will cumulatively test all of the previous midterm material, although it will emphasize new material from the last few weeks of the course.
• Each Exam (including Final Exam) will be worth the **same weight** toward your overall course percentage and final letter grade.
• **ONE lowest Exam score (percentage) will be automatically dropped** for each student. The Final Exam is included in this calculation and is eligible to be dropped.
• **NO MAKE-UP EXAMS ARE AVAILABLE.** If you miss an exam, that score of zero is eligible to become your one dropped exam score.

Exam Dates

Midterm #1	**Mon. Feb. 8, 10:30-11:30am**	Chaps. 1–2, portions of Chap. 3
Midterm #2	**Mon. Mar. 1, 10:30-11:30am**	Chaps. 3–5
Midterm #3	**Mon. Mar. 29, 10:30-11:30am**	Chaps. 6–8
Midterm #4	**Mon. Apr. 19, 10:30-11:30am**	Chaps. 9–10, 13
Final Exam	**Mon. May 10, 9:45–11:45am**	Chaps. 11–12, 14–16 & cumulative review

Exam Administration & Conditions

• Exams will be administered in our **Laulima** course site, under the **Tests & Quizzes tab**. **Each exam should appear in Laulima 10–15 minutes before each exam's official start time.**

• A 60-minute Laulima countdown clock will start when you begin each Midterm Exam, and 120 minutes for the Final Exam. It will continue counting even if you close your Laulima window. You can submit your exam anytime before the time has ended (although, if you finish early, consider using your remaining time to double-check your answers and calculations). Otherwise, your exam will automatically self-submit when the time elapses.

• Exams must be submitted in Laulima by each exam's end time. When the end time arrives, your exam will close, regardless of how much time remains on your countdown clock.

• If you experience problems with Laulima during your exam, you should IMMEDIATELY contact your instructor by phone: (808) 956-2922. E-mail should be used as a second resort, but will result in much slower assistance.

• Scores and correct answers should be viewable in Laulima roughly one day after each exam. Please watch for an announcement when scored exams have been released.

• Each Midterm Exam will have 20–35 questions in 60 minutes, and the Final Exam will have 60–80 questions in 120 minutes. Questions will vary in value from 0.5 to 2.0 points each, **a mix of short conceptual questions and longer problems that require calculation. Some problems are multiple-choice, while others will require numerical entry.**

• **All exams will be OPEN-BOOK and OPEN-NOTES, both paper and electronic.** You are allowed to use all of our course materials, Mastering Physics, any textbook, and other non-human online resources (websites, videos, simulations, formula sheets). Use of a calculator is allowed and expected.

• The following assistance is FORBIDDEN during your exam: Any communication (voice, video, written, or otherwise) with any other human or Artificial Intelligence system. "Any other person" includes, but is not limited to, all students, tutors, TAs, experts, and responses from Chegg or other "study sites."

• These exams are NOT proctored, via Zoom or otherwise. You are bound by the UH Manoa Student Conduct Code to perform the exam within the prescribed conditions and without assistance.

• **No make-up exams are available.** If you miss an exam for any reason, that score of zero is eligible to become your one dropped exam score.

Exam Advice

• **Click "SAVE" often!** This will protect your work, in case you accidentally close your window or have other computer problems. Note that the "**Save**" and "**Submit**" buttons are different and separate. If your time runs out before you click Submit, then only "Saved" answers might be scored, but unsaved answers might not.

• Plan in advance to use a **reliable computer with reliable Internet access and reliable electricity**. Turn off notifications and other things that will distract you during the exam.

• **Compile your own formula sheet ("cheat sheet") as you go during the semester, and use it as your primary reference during exams.** Important formulas, laws, principles, and concepts are usually located in obvious brightly colored boxes in our lecture slides and textbook chapters, and they are also partially collected in our textbook's end-of-chapter summaries — compile them onto one or two pages for quick reference. Although our exams are "open book," hunting through class materials to find a formula will consume valuable time.

• **Have your own favorite, familiar scientific calculator at hand during exams**. This will increase your speed and decrease your likelihood of making errors. Although most computers, mobile devices, and even webpages have scientific calculator apps, you should not rely on those as your primary calculator resource during exams unless you are already very comfortable with their use.

• **Have scratch paper ready** for calculations. Although your work does not need to be shown for credit (only final numerical answers must be entered), the more algebraic steps that you write out, the less likely you are to make a math error.

• **Work quickly** — our exams are long, and the time is short, so if you do not immediately know how to solve a particular problem, flag it and return to it later. Questions are NOT necessarily in order of difficulty, so there may be some harder questions earlier and easier questions later. If you finish everything, use your remaining time to double-check your answers and calculations.

Online Homework

• **Online Homework** assignments in **Mastering Physics** (MP) will be **due most, *but not all*, Mondays, Wednesdays, and Fridays at 11:59 pm**. Each assignment will usually be posted roughly a week before it is due. Please check Mastering Physics regularly for assignments and due dates.

• Points

– Point values for each problem are based on its difficulty, number of parts, time required, and importance. For multi-part problems, Mastering Physics divides the problem's points evenly between the parts.

– Homework points (and time required) vary widely from assignment to assignment, typically in the range of 20–60 points.

– Online HW points will be simply added up to form a grand total for the entire semester, in the range of 1000–1500 points. Therefore, individual HW points weigh equally in your Online HW Total, and percentage-scores for individual HW assignments do not matter.

• Penalties

This should match the Grading Policy that can be viewed in MP for our assignments:

Lateness: Minus 20% per day past the due date/time, decreasing to zero credit at 5 days. This penalty is applied ONLY to individual late problems, not to the entire assignment score. Also, the penalty is prorated for fractions of day (i.e., 2 hours late ⇒ –1.7% penalty).

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

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

• Bonuses

Assignments will sometimes contain one or more problems for **extra credit**, and those problems should be labeled as such in Mastering Physics. Those few assignments will therefore have a maximum possible score >100%.

• Optional Non-Credit Assignments

Any Mastering Physics assignments that are labeled "NOT FOR CREDIT" are for optional practice. They are not worth any points toward your Online HW total.

Discussion Sessions & Problem Sets

• Each student chose a particular "Section" of PHYS 151 during course registration. Each Section has a different **weekly meeting time scheduled on Tuesday, Wednesday, or Thursday** for a **synchronous Discussion Session via Zoom** with up to 20 students. Discussion Sections will be run by our undergraduate Learning Assistants (LAs).

Zoom Address: Meeting ID: **413-810-7726**
OR Use this link to launch Zoom & join meeting: https://hawaii.zoom.us/j/4138107726
Passcode: **EmcSquared**

• **Discussion Problem Sets** will be provided at the start of each week's Discussion Session. These problems are intended to be solved with collaboration and assistance from classmates and LAs, primarily during the Discussion Session itself. Further work can be completed after the Discussion Session, before submitting final answers.

• **Attendance on Zoom** will be recorded by LAs, and **is required to earn credit for that week's Problem Set**.

• **Problem Set answers are due in Laulima by the following Monday at 11:55 pm.** Answer forms should be available under Laulima's Tests & Quizzes tab.

• If a particular Problem Set is submitted multiple times, the **highest score** will be counted.

• **TWO lowest Problem Set scores (percentages) will be automatically dropped** for each student.

• All remaining Problem Set percentages will be **averaged together with equal weight** to become each student's Discussion Problem Set percentage.

Textbook Reading & Additional Problems

• **Reading assignments** (textbook 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. For each topic, lecture 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.

• Use our textbook more like a reference manual or cookbook, instead of reading it through start-to-finish like a novel:

- Skim the relevant textbook sections in advance of their related lecture, then go back and read 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 use when working on homework problems.

• eBook: There are several ways to access the eBook through Mastering Physics:

– Follow the "Pearson eText" tab along the left-hand side of our course page
– Follow the "Study Area" tab along the left-hand side of our course page
– 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 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. **Short answers to all odd-numbered end-of-chapter problems are located in the textbook Appendix.**

Solving Physics Problems & "Showing Your Work"

In Spring 2021, you will NOT be asked to submit detailed work for Online HW or Exams. However, the following is generally 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 only help you later when 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 mathematical value, or in an un-simplified algebraic form.

In summary, "showing your work" should include:

1. **Initial Formula**, followed by major algebraic rearrangement steps (if necessary)
2. **Substitution**: "plugging in" known values, followed by major calculation steps (if necessary)
3. **Final Answer**: underlined or boxed, with proper **units**, **sci. notation** (if needed), & **significant figures**
4. Additional **diagrams** or **comments**, as needed to define quantities. (A picture is worth 10^3 words!)

• **Organization** and **neatness** matter! Both should result naturally if you follow the above format. Disorganized or illegible work can lead to both mathematical and conceptual errors.

Collaboration

Working in pairs or groups is common in science, and indeed is encouraged! Teamwork can help you to make more efficient measurements and to catch errors, and explaining something to another person is a great way to learn it yourself. However, if you are working with a classmate while completing a physics assignment (or while making measurements in lab), there are a few guidelines to follow:

(1) You are strongly encouraged **first to attempt each homework problem YOURSELF, individually** (or, in lab, to make some of your lab measurements yourself). That way, you will get the educational value and the experience that comes from working the problem (or using the equipment) and "seeing for yourself." Then, after you have tried first on your own, you can compare your answer (or lab results) to others' work as a "sanity check."

On homework: If you are stuck on a homework problem, you should seek just enough help to get unstuck. It is unwise to let someone simply feed you the entire solution, because you lose the educational value of working through the problem on your own. If necessary, try changing the numerical values in the problem and attempting it again by yourself, to ensure that you understand completely how to do the problem if you were to encounter it again on your own, like during an exam.

In lab: If your results differ from your classmates' results by only a bit, then *you should keep your own results* — most scientific measurements vary slightly due to random error (this will be discussed in lab), so you should *not* change yours to match your classmates' results exactly. After all, how do you know which result is "correct," yours or your classmates'? Record what *you* see or measure. Of course, if your results differ *wildly*, then it is appropriate to try to figure out "what went wrong." However, small variations are common and are a natural part of the random error inherent in making most measurements. Please consult with your lab TA if you have questions about this.

(2) All free-response solutions on all submitted assignments should ultimately be **in your own words, reflecting your own understanding** of the problems. You should plug numbers into your calculator and attempt all calculations *yourself*, even if you received assistance from others along the way.

Any homework passages or calculations that are **directly copied or plagiarized** from another student (or portions lifted from any other uncited source) will be given a score of **zero**. Again, your submitted work should reflect *your own understanding* of the problems.

In lab: If you make measurements together with a lab partner, make a note in your lab report of who your lab partner was for any particular experiment. Be sure that your final calculations, analysis, and written passages of your lab reports are *in your own words*, even if your initial data or measurements are identical to your partner's. Please consult with your lab TA if you have questions about this.

Getting Help with Physics

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

• PHYS 151 Learning Assistants (LAs) — weekly schedule of Zoom Help Sessions:
Drop in to ask our dedicated PHYS 151 peer-tutors questions about any course material. Current schedule:
https://tinyurl.com/Phys151Spr21LASchedule

Zoom: Meeting ID: **413-810-7726**
OR Use this link to launch Zoom & join meeting: https://hawaii.zoom.us/j/4138107726
Passcode: **EmcSquared**

• **Physics Lab TAs** (mostly graduate students in Physics) should have scheduled two hours/week of "office hours" via Zoom. 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. Ask your PHYS 151L lab TA for their personal office hour information:
https://www.phys.hawaii.edu/~philipvd/21_spring_intro_labs_uhm.html

• The **Learning Assistance Center** (formerly in Sinclair Library, now via Zoom) offers free one-on-one tutoring by appointment for physics and many other introductory math & science courses. Make an appointment online at least 24 hours in advance:
http://manoa.hawaii.edu/undergrad/Learning/tutoring/

• The **Housing Success Center** (formerly in the Hale Aloha Cafeteria, now via Zoom) is open Sunday–Thursday, 6:00–9:00pm, for free, drop-in assistance for physics and other introductory math & science courses. Check their schedule of tutors & subjects online here:
http://manoa.hawaii.edu/undergrad/Learning/hsc/

PHYS 151 Spring 2021 Calendar of Topics & Textbook Sections *Version: 13 Jan 2021*

• This is an intended schedule of topics, but actual subject matter covered by each date may lag behind. In that case, exams will only cover material actually discussed in lecture before each exam date. Relevant chapters and sections will be confirmed before each exam.

• For each section/topic 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 familiarize yourself *qualitatively* with their 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*, 11th ed.**
M Jan 11	Lect #1	Intro to PHYS 151 *[[§1.1–1.2: Intro to Physical Laws & Models]]* Chap. 0: Math Review *(self-review, not in lecture)* §0.1–0.2: Powers-of-10 & Scientific Notation
W Jan 13	Lect #2	§1.3–1.4: SI/Metric Units & Prefixes; Unit Conversions §1.5: Uncertainty & Significant Figures *[[§1.6: Estimates & Orders of Magnitude]]*
F Jan 15	Lect #3	§2.1–2.2: Position & Displacement, Speed & Velocity
(M Jan 18)	HOLIDAY	
W Jan 20	Lect #4	§2.1–2.2: Graphing Position & Velocity
F Jan 22	Lect #5	§2.3: Acceleration; Graphing Acceleration
M Jan 25	Lect #6	§2.4–2.5: Kinematics with Constant Acceleration
W Jan 27	Lect #7	§2.6: Freefall
F Jan 29	Lect #8	§1.7–1.8: Vectors vs. Scalars, Vector Notation, Vector Components
M Feb 1	Lect #9	§1.7–1.8: Vector Arithmetic: Scalar Multiplication, Addition/Subtraction
W Feb 3	Lect #10	§2.7, 3.5: Relative Velocity, Adding Velocities in 1-D & 2-D §3.1–3.2: 2-D Kinematics
F Feb 5	Lect #11	§3.3: Projectile Motion
M Feb 8 10:30am	**MIDTERM #1 on Laulima**	**Chaps. 1–2, parts of Chap. 3**
W Feb 10	Lect #12	§4.1–4.6: Common Forces, Newton's Laws of Motion, Free-body Diagrams
F Feb 12	Lect #13	§5.1–5.2: Applying Newton's 2nd Law: 1-D & 2-D Dynamics & Equilibrium
(M Feb 15)	HOLIDAY	
W Feb 17	Lect #14	§5.4 & 11.2: Elastic Force: Ideal Springs & Hooke's Law *[[§11.1: Stress & Strain; Elasticity vs. Plasticity]]* §5.3: Force of Surface Friction (Kinetic & Static) *[[§5.3: Fluid Drag]]*
F Feb 19	Lect #15	§5.2–5.3: Applying Newton's 2nd Law: Inclines *not in textbook*: Simple Machines & Mechanical Advantage §5.5: Four Fundamental Forces of Nature
M Feb 22	Lect #16	§11.2: Period, Frequency & Angular Frequency §3.4, 6.1: Uniform Circular Motion, Centripetal Acceleration & Force §6.2: Motion in a Vertical Circle
W Feb 24	Lect #17	§6.3: Newton's Law of Universal Gravitation §6.4: Weight & Surface Gravity
F Feb 26	Lect #18	§6.5: Orbits *not in textbook:* Kepler's Laws of Planetary Motion
M Mar 1 10:30am	**MIDTERM #2 on Laulima**	**Chaps. 3–5**
W Mar 3	Lect #19	§7.1–7.3: Energy, Work, Work-Energy Theorem §7.8: Power
F Mar 5	Lect #20	§7.5: Gravitational Potential Energy §7.4–7.5: Elastic Potential Energy §7.7: Conservative vs. Non-conservative Forces
M Mar 8	Lect #21	§7.6: Conservation of Energy
W Mar 10	Lect #22	§8.1, 8.5: Momentum & Impulse
F Mar 12	Lect #23	§8.2: Conservation of Momentum §8.3–8.4: Elastic vs. Inelastic 1-D Collisions

	& Lect #24	*[[§8.8: Rocket Propulsion]]* §8.6-8.7: Center of Mass, Velocity of CM
(Mar 15-19)	NO CLASSES	SPRING BREAK
M Mar 22	Lect #25	§9.1–9.3: Rotational Kinematics §9.4: Moment of Inertia, Rotational Kinetic Energy §9.5: Rolling Objects
W Mar 24	Lect #26	§10.1: Torque §10.2: Rotational Dynamics §10.3: Rotational Work §10.6: Static Equilibrium & Stability, Mechanical Advantage of Levers
(F Mar 26)	HOLIDAY	
M Mar 29 10:30am	**MIDTERM #3 on Laulima**	**Chaps. 6–8**
W Mar 31	Lect #27	§10.4–10.5: Angular Momentum; Conservation of Ang. Mom. §10.7: Vector Nature of Angular Quantities *[[§10.7: Gyroscopes & Precession]]*
(F Apr 2)	HOLIDAY	
M Apr 5	Lect #28	§13.1: Density §13.2: Pressure, Pascal's Principle, Hydrostatic Pressure Increase with Depth
W Apr 7	Lect #29	§13.3: Archimedes' Principle & Buoyancy
F Apr 9	Lect #30	§13.5: Flowing Fluids: Continuity Equation §13.6–13.8: Flowing Fluids: Bernoulli's Equation & Principle
M Apr 12	Lect #31	§11.2–11.4: Simple Harmonic Motion & Energy Conservation
W Apr 14	Lect #32	§11.5: Simple Pendulums *[[§11.6: Damped Oscillations, Driven Oscillations, Resonance]]*
F Apr 16	Lect #33	§12.1, 12.3: Mechanical Waves & Wave Speeds §12.2: Continuous Waves *[[§12.4: Mathematical Description of Continuous Waves]]* §12.5: Reflection & Transmission *[[§12.9, 12.13–12.14: Sound Waves & Acoustics]]* §12.10: Wave Energy & Intensity, Decibel Scale of Loudness
M Apr 19 10:30am	**MIDTERM #4 on Laulima**	**Chaps. 9–10, 13**
W Apr 21	Lect #34	§12.5: Principle of Superposition §12.8: Constructive & Destructive Interference §12.11: Beats §12.6: Standing Wave Modes (Normal Modes) on a String
F Apr 23	Lect #35	§12.7: Standing Wave Modes in Air Columns §12.12: Doppler Effect & Shock Fronts
M Apr 26	Lect #36	§14.1–14.2: Temperature *[[§16.8: Absolute Zero]]* §14.3: Thermal Expansion of Solids & Liquids §14.4: Heat; Heat Capacity & Specific Heat
W Apr 28	Lect #37	§14.5–14.6: Latent Heat & Phase Transitions *[[§14.7: Heat Transfer Methods: Conduction, Convection, Radiation]]*
F Apr 30	Lect #38	§15.1–15.2: Equations of State, Ideal Gas Law §15.2: *PT* Phase Diagrams §15.3–15.4: Kinetic Theory of Gases, Maxwell-Boltzmann Distributions
M May 3	Lect #39	§15.5: 1st Law of Thermodynamics §15.5: Work Done by/on a Gas, *PV* Diagrams §15.6–15.7: Constant-Value & Adiabatic Thermodynamic Processes
W May 5	Lect #40	§16.1–16.2: Reversible Processes & Heat Engines *[[§16.3–16.4: Combustion Engines & Refrigerators]]* *[[§16.9: Efficiencies of Real-World Processes]]* §16.5–16.6: 2nd Law of Thermodynamics, Carnot Engines §16.7: Entropy
M May 10 9:45-11:45a	**FINAL EXAM**	**Cumulative, with emphasis on Chaps. 11–12, 14–16**