PHYSICS 151 — COLLEGE PHYSICS I

UH MANOA — Fall 2020 Semester

Course Information & Policies

Version: 30 Aug 2020

As Fall 2020 campus policies and exam procedures evolve in response to the Covid-19 pandemic, and as your instructor tests new tools and methods, **THIS SYLLABUS IS SUBJECT TO CHANGE**. Any substantive changes will be announced via e-mail. Thank you in advance for your patience and flexibility.

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Zoom "Office" Hours: Tues & Thurs, 11:00am–1:00pm, or other times by appointment
Meeting ID: 985 056 1125
Passcode: 205993
Link with passcode embedded:
https://zoom.us/j/9850561125?pwd=Sk9VNWxKTjBoNEdTU0RPd0FXMC9oUT09

Lecture

~~Sec. 1: MWF 9:30–10:20am, Physical Science Building (PSB or PhySci), Rm. 217~~
~~Sec. 2: MWF 10:30–11:20am, PSB 217~~

- *No synchronous lectures, only asynchronous slides, videos, and practice problems.*
- *Exams will require attendance at specific dates/times (TBD), either at on-campus testing centers or online proctoring services.*

Assistance

see "Getting Help" section on p.6 for online schedules & more info

FREE Physics Tutoring Resources for UH Manoa students:

- Learning Assistant (LA) Help Session drop-in assistance
  - *starts 2nd or 3rd week of semester*
  - *location & format TBD*
- Physics Lab TA office hours ~~in Watanabe 421~~ *via Zoom*
  - *starts 2nd week of semester*
  - ask your own PHYS 151L Lab TA for Zoom/contact information
- ~~Natural Sciences Learning Emporium drop-in tutoring in Bilger Addition 209~~
  - ~~*starts 2nd week of semester*~~
  - *CANCELED in Fall 2020 due to budget constraints*
- Learning Assistance Center tutoring by appointment ~~in Sinclair Library~~ *via Zoom*
  - *starts 2nd week of semester*
  - one-on-one sessions, online appointment needed ≥24 hrs. in advance
- Housing Success Center drop-in tutoring ~~in Hale Aloha Cafeteria~~ *via Zoom*
  - *starts 2nd week of semester*

Required Materials

TEXTBOOK: **Young & Adams, *College Physics***, 11th ed. (2020), Chaps. 1–16 (vol. 1)

- eBook plus Mastering Physics online homework system: $58.82 automatic "IDAP" charge to your student account around Tue. Sept. 15, unless you "opt-out" by Tue. Sept. 15 (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 Sept. 15).
- 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

ONLINE HOMEWORK:

- Mastering Physics — via automatic IDAP charge to your student account (see separate handout for access instructions and additional details)

SCIENTIFIC CALCULATOR with scientific (power-of-10) notation, trig functions, exponents & logarithms

- Necessary and expected for exams and homework.
- Recommended for lectures (for solving tutorial problems).
- Graphing or programmable calculators are allowed, but NOT necessary.
- ***Smart phones, tablets, computers, or similar devices are NOT permitted as calculators during exams.***

Optional Book Gonick & Huffman, *The Cartoon Guide to Physics* (1990) paperback

- Not stocked in UH Bookstore this semester. Purchase elsewhere, if desired.
- Contains topics from both PHYS 151 & 152.
- Mostly non-mathematical and conceptual treatment, similar to PHYS 100.

Course Materials

Google Drive Folder:

Most course materials (lectures, tutorials, solutions) will be gradually posted throughout the semester here for viewing or download:

https://tinyurl.com/phys151fall2020

Please log in to Google with your hawaii.edu account to access this folder.

Laulima: Although our PHYS 151 Laulima site will show an archive of e-mail announcements, it will not be used for serving other course content or collecting assignments.

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).

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.

- There will be no PHYS lab class meetings for PHYS 100L–272L during the first week of the semester. Lab classes start on Mon. Aug. 31.
- The supervising professor for our lab classes is Dr. Philip von Doetinchem, Please see his PHYS lab webpage for much more information, including a list of TAs:

https://www.phys.hawaii.edu/~philipvd/20_fall_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 2nd 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.

Course Grades

Your **overall course percentage** will be computed as follows:

Online Homework percentage — 30%
Top 4 of 5 Exam percentages (4 Midterm Exams & Final Exam) — 17.5% each

Final letter-grade cutoffs:								
	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.

Online Homework

• **Online Homework** assignments in **Mastering Physics** (MP) will be due up to three times per week, **always MWF at 12:00 noon**. Each assignment will usually be posted about a week before it is due. Please check Mastering Physics regularly for assignments and due dates.

• Points

– Point values are given to each problem based on its difficulty, number of parts, time required, and importance. For multi-part problems (very common), Mastering Physics divides the problem's points evenly between the parts.
– Homework points will vary greatly from assignment to assignment, typically in the range of 25-50 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 points will weigh equally in your course HW total, and percentage-scores for particular HW assignments will 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 0 credit at 5.0 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 0 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 assignments will therefore have a maximum possible score >100%.

• Adaptive Follow-ups

I will activate an **Adaptive Follow-up Assignment** (No Credit) for every Mastering Physics HW assignment — you should be able to access each one after you complete its "parent" assignment. Based on your performance, MP will create a customized set of follow-up questions for you. These are simply for extra practice if you wish, and they are NOT worth points toward your course grade.

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 will be worth the same weight toward your overall course percentage and final letter grade.
• **Your ONE lowest Exam score (percentage) will be dropped**.
• **No make-up exams will be offered.**

Exam Dates

*The following **EXAM DATES ARE SUBJECT TO CHANGE,** depending on testing facilities and options:*

Midterm #1	**Friday, September 18**	Chaps. 1–3
Midterm #2	**Friday, October 9**	Chaps. 3–5
Midterm #3	**Friday, October 30**	Chaps. 6–8
Midterm #4	**Friday, November 20**	Chaps. 9–10, 13
Final Exam	**Dec. 14 (Sec. 1) & 18 (Sec. 2), 9:45–11:45am**	Chaps. 11–12,14–16 & cumulative review

Exam Conditions & Materials

• You will be provided a **formula sheet** for each exam, bearing the essential physics formulas covered during all prior weeks of the course. This sheet will include any necessary physical constants. Apart from this formula sheet, your exam is otherwise **CLOSED BOOK**.

• **ALLOWED** and expected materials:
  – **Formula sheet** provided by your instructor
  – **Scientific calculator** with trigonometric & exponential/logarithmic functions and power-of-10 notation. (Graphing calculators are allowed, but not required.) ***Smart phones, tablets, computers, or other similar devices are NOT allowed as calculators.*** You must disable any Internet capabilities of your calculator.
  – Two blank sheets of scratch paper, plus pencils, pens, and erasers

• **NOT allowed:**
  – **ANY OTHER resources or references, paper or electronic**
  – Any textbooks or associated materials (Mastering Physics, study guides, problems, solution manuals)
  – Any lecture notes, videos, sample problems/solutions, homework problems/solutions

• **NO collaboration** of any sort is allowed. Exams must be **entirely your own work**. Exam answers that are copied from another student, even partially, will be given a score of **zero**. Cases of cheating or plagiarism may be referred to the Office of Judicial Affairs for disciplinary review.

Exam Locations & Online Proctoring Services

You can take each exam in one of two ways, depending on your location:
(1) In person, in large testing centers on the UH Manoa campus, free of charge.
(2) Via an online proctored testing service, probably with a fee for each exam.

NOT YET KNOWN: Cost of online testing fee; companies being used for online proctoring; location or nature of in-person testing centers on campus. ***EXAM ADMINISTRATION IS SUBJECT TO CHANGE****, depending on this information.*

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 becomes particularly 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
  • Scattered throughout MP homework problems and study resources, you will see hyperlinks that will open relevant portions of the eBook.

• **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.

• Solving physics problems is a skill learned through repeated practice, similar to a sport or musical instrument. Therefore, 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 FALL 2020, you will NOT be asked to submit detailed work for any HW or exams. However, the following is generally good practice for solving physics problems, so please follow it whenever possible:

~~On all assignments and exams that call for free-response answers, you must **SHOW YOUR WORK**. Writing only the correct final answer without showing your steps is *not* acceptable, and you will receive little or no credit.~~ Why? 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.

~~To receive full credit, your answers to **free-response ("show your work") problems** MUST contain the following:~~

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 will be penalized.

• Please do NOT use **red ink** on any assignments or exams — we reserve that color for grading.

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

• **Regularly-scheduled weekly Help Sessions** will be held by our PHYS 151 Learning Assistants (LAs) via Zoom. You can drop in for assistance on physics problems from homework assignments, lecture tutorials, exams, or textbook. *Days & times TBA.*

~~• The **Physics Learning Center in Watanabe 421** is open whenever Watanabe Hall is open, for all students to use to study (alone or together) on physics homework. There are tables, sofas, blackboards, etc., available for your use.~~ *CLOSED since March 2020.*

• All Physics lab TAs should schedule two hours/week of office hours ~~in Watanabe 421~~ *via Zoom*. Although lab TAs *must give first priority to students with lab-related questions*, as time permits, they can also assist with lecture homework problems or other physics questions. Ask your PHYS 151L lab TA for their personal office hour information:
https://www.phys.hawaii.edu/~philipvd/20_fall_intro_labs_uhm.html

~~• The **Natural Sciences Learning Emporium** in Bilger Addition 209 is open Mon–Fri, 8:00am–6:00pm, for all students to seek free, drop-in assistance with lower-division math or science classes, or just to use the group study tables to work together. Schedules of tutors for physics and all other subjects are posted on the door to BilA 209 and online here:~~ *Physics Tutoring CANCELED for Fall 2020 due to budget constraints.*
For other subjects: BilA 209 CLOSED since March 2020 — all Learning Emporium assistance now via Zoom & asynchronous forums:
http://uhnatsci.org/emporium/tutorschedules.php

• The **Learning Assistance Center** ~~in Sinclair Library~~ *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** ~~in the Hale Aloha Cafeteria (tall cylindrical dormitories)~~ *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/

• You may also make an appointment to see me (via Zoom) during times other than my regularly scheduled help sessions or office hours.

• The Department of Physics & Astronomy Office (Watanabe 416) maintains a list of graduate students and others who are available for hire as **private tutors** — please ask our Department secretary for a copy of the list: physics@hawaii.edu

PHYS 151 Fall 2020 Calendar of Topics & Textbook Sections

• This is an *intended* schedule of topics, but actual subject matter covered during each lecture 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 clarified before each exam, as needed.

• 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 Aug 24	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: Exponents & Scientific Notation
W Aug 26	Lect #2	§1.3–1.4: Units & Prefixes; Unit Conversions §1.5: Uncertainty & Significant Figures *[[§1.6: Estimates & Orders of Magnitude]]*
F Aug 28	Lect #3	§2.1–2.2: Position & Displacement, Speed & Velocity
M Aug 31	Lect #4	§2.1–2.2: Graphing Position & Velocity
W Sept 2	Lect #5	§2.3: Acceleration; Graphing Acceleration
F Sept 4	Lect #6	§2.4–2.5: Kinematics with Constant Acceleration
(M Sept 7)	HOLIDAY	
W Sept 9	Lect #7	§2.6: Freefall
F Sept 11	Lect #8	§1.7–1.8: Vectors vs. Scalars, Vector Notation, Vector Components
M Sept 14	Lect #9	§1.7–1.8: Vector Arithmetic: Scalar Multiplication, Addition/Subtraction
W Sept 16	Lect #10	§3.1–3.2: 2-D Kinematics §2.7, 3.5: Adding Velocities in 1-D & 2-D
F Sept 18	**MIDTERM #1**	**Chaps. 1–3**
M Sept 21	Lect #11	§3.3: Projectile Motion
W Sept 23	Lect #12	§4.1–4.5: Common Forces, Newton's Laws of Motion
F Sept 25	Lect #13	§4.6: Free-body Diagrams, 1-D & 2-D Force Problems §5.1: Dynamic Equilibrium
M Sept 28	Lect #14	§5.4: Elastic Force (Ideal Springs) & Hooke's Law *[[§11.1: Stress & Strain]]* §5.3: Force of Surface Friction (Kinetic & Static) *[[§5.3: Fluid Drag]]*
W Sept 30	Lect #15	§5.2–5.3: Inclines *not in textbook*: Simple Machines & Mechanical Advantage §5.5: Four Fundamental Forces of Nature
F Oct 2	Lect #16	§11.2: Period & Frequency §3.4, 6.1–6.2: Uniform Circular Motion, Centripetal Acceleration & Force
M Oct 5	Lect #17	§6.3–6.4: Newton's Law of Universal Gravitation; Surface Gravity
W Oct 7	Lect #18	§6.5: Orbits & Kepler's Laws
F Oct 9	**MIDTERM #2**	**Chaps. 3–5**
M Oct 12	Lect #19	§7.1–7.3: Energy, Work, Work-Energy Theorem §7.8: Power
W Oct 14	Lect #20	§7.5: Gravitational Potential Energy §7.4–7.5: Elastic Potential Energy §7.7: Conservative vs. Non-conservative Forces
F Oct 16	Lect #21	§7.6: Conservation of Energy
M Oct 19	Lect #22	§8.1, 8.5: Momentum & Impulse
W Oct 21	Lect #23	§8.2: Conservation of Momentum §8.3–8.4: Elastic vs. Inelastic 1-D Collisions *[[§8.8: Rocket Propulsion]]*
F Oct 23	Lect #24	§8.6-8.7: Center of Mass, Velocity of CM
M Oct 26	Lect #25	§9.1–9.3: Rotational Kinematics §9.4: Moment of Inertia, Rotational Kinetic Energy

		§9.5: Rolling Objects
W Oct 28	Lect #26	§10.1: Torque §10.2: Rotational Dynamics §10.3: Rotational Work §10.6: Static Equilibrium & Stability, Mechanical Advantage of Levers
F Oct 30	**MIDTERM #3**	**Chaps. 6–8**
M Nov 2	Lect #27	§10.4–10.5: Angular Momentum; Conservation of Ang. Mom. §10.7: Vector Nature of Angular Quantities *[[§10.7: Gyroscopes & Precession]]*
W Nov 4	Lect #28	§13.1: Density §13.2: Pressure, Pascal's Principle, Hydrostatic Pressure Increase with Depth
F Nov 6	Lect #29	§13.3: Archimedes' Principle & Buoyancy
M Nov 9	Lect #30	§13.5: Flowing Fluids: Continuity Equation §13.6–13.8: Flowing Fluids: Bernoulli's Equation & Principle
(W Nov 11)	HOLIDAY	
F Nov 13	Lect #31	§11.2–11.4: Simple Harmonic Motion & Energy Conservation
M Nov 16	Lect #32	§11.5: Simple Pendulums *[[§11.6: Damped Oscillations, Driven Oscillations, Resonance]]*
W Nov 18	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
F Nov 20	**MIDTERM #4**	**Chaps. 9–10, 13**
M Nov 23	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
W Nov 25	Lect #35	§12.7: Standing Wave Modes in Air Columns §12.12: Doppler Effect & Shock Fronts
(F Nov 27)	HOLIDAY	
M Nov 30	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 Dec 2	Lect #37	§14.5–14.6: Latent Heat & Phase Transitions *[[§14.7: Heat Transfer Methods: Conduction, Convection, Radiation]]*
F Dec 4	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 Dec 7	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 Dec 9	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 Dec 14 **F Dec 18**	**FINAL EXAM**	**Cumulative, with emphasis on Chaps. 11–12, 14–16**

OMITTED sections of textbook:
§13.4: Surface Tension & Capillarity