PHYSICS 151 – COLLEGE PHYSICS
UH MANOA – Summer Session II 2019

Course Information & Policies

Lecture: MTWRF 9:00–10:15 a.m.
Watanabe Hall ("Wat")
Rm. 112

Instructor: Mr. Samuel Mukai
E-mail: mukais@hawaii.edu
Office: Watanabe Hall, Rm. 312
Office Hours: Tue & Thu 1:00-2:00 pm or by appointment
Office Hours Location: Saunders 114 or Saunders 112

Grader: Andi Erickson

Required Materials: TEXTBOOK: OpenStax, College Physics, Chaps. 1–17 Available here: https://openstax.org/details/college-physics

- PDF version (free — download either low- or high-resolution) — also uploaded to our course Dropbox "Textbook" folder
- Web-based version (free — requires real-time Internet access)
- Enhanced iPad version ($3 per half) (available only for Apple tablets)
- Hardcover version ($48.50 new, via Amazon.com or UH Bookstore; $37 used at UH Bookstore)

SCIENTIFIC CALCULATOR with scientific notation, trigonometric functions, exponents, & logarithms. Graphing or programmable calculators are allowed, but NOT necessary.

Bring a calculator to lab & exams (necessary!) and lectures (needed for occasional in-class questions). **Smart phones, tablets, computers, or similar devices are NOT permitted during exams!**

Course Materials:
Laulima will be the primarily means of communications outside of the classroom. This syllabus will be posted on Laulima. Homework assignments are listed on the course calendar, also on Laulima. Homework assignments must be done on 11x8 folder paper and submitted on the due date. Laulima's gradebook function will be used for communicating grades. Solutions of homework or exams will not necessarily be available. In the case that I do decide to provide solutions, how it is communicated will be determined at a later time.

Course Description
This course is the first half of a two-semester introduction to the fundamentals of physics, and will cover mechanics (kinematics, dynamics, gravitation, energy, momentum, rotation), waves,

and thermodynamics. Lectures and problems will regularly use the mathematical tools of algebra, geometry, trigonometry, and vectors, but not calculus.

Prerequisite: A 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 also need to take PHYS 151L lab, it is strongly recommended 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, UH Manoa does not require concurrent enrollment in PHYS 151L lab with PHYS 151 lecture, so you can instead take PHYS 151L lab in a future term, or not at all.

PHYS 151 Learning Outcomes
General: At the conclusion 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 how and where these principles occur in natural phenomena, technological and professional applications, and daily life.

PHYS 151 Learning Outcomes
Detailed: At the conclusion of this course, students should be able to:

- Understand 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.
- Recognize vector vs. scalar quantities; convert two-dimensional vectors from magnitude & direction to coordinates; perform scalar multiplication and addition of vectors.
- Understand 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 simple systems of masses.
- Apply Kepler's Laws of Planetary Motion to describe and calculate the properties of simple orbits.
  Understand and be able to calculate various forms of energy, including mechanical work, kinetic energy, and potential energies.
- Understand the meaning of Conservation of Energy and its relationship to conservative vs. non-conservative forces, and apply Conservation of Energy to determine kinematic properties of appropriate systems.
- Understand the relationship between force and impulse/momentum, and apply it to determine kinematic properties of appropriate systems.
  Understand the meaning of Conservation of Linear Momentum and its relationship to

elastic vs. inelastic collisions, and apply Conservation of Momentum to determine kinematic properties of appropriate systems.
- Understand the analogy between rotational and translational kinematic & dynamic quantities, formulas, and conservation laws, and apply them to determine kinematic properties of rotating systems.
- Understand the definitions of density and pressure, and apply them (and related laws) to a variety of fluid mechanical situations, including hydrostatics, buoyancy, and systems of confined fluid flow.
- Describe the kinematics and energy conservation of simple harmonic motion and similar systems.
- Understand the nature and simple equations of waves and wave motion, superposition & interference, and formation of one-dimensional standing-wave modes.
- Understand the phases/states of matter, the kinetic basis of temperature, and the primary modes of heat/energy transport; use specific heat capacity and latent heat to quantitatively relate heat to temperature.
- Understand the basic kinetic theory of gases; apply the ideal gas law to various transformations of a confined gas; and find the work performed during isobaric expansion/contraction.
- Understand the 1st Law of Thermodynamics in general, and apply it quantitatively to ideal gas transformations.
- Qualitatively and quantitatively define changes in entropy; describe the meaning of the 2nd Law of Thermodynamics; understand the model of a heat engine and calculate its efficiency.

Grading & Course Work

Final grades will be computed based on your overall course percentage, computed as follows:

Midterm Exams and Final Exam 40%
Homework (Paper) 60%

Final letter-grade cutoffs:

90.0% 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

At the end of the semester, these cutoffs may be lowered at the instructor's discretion, but they will not be raised. Grades will be updated frequently on Laulima. I urge you to double-check your scores on my grade sheets, as well as the score tallies on your individual papers. While I apologize in advance for any errors, they do happen with such a large class, please help me to correct them. Final exam scores and final grades will be published (and grades will appear in MyUH) shortly after the term ends. However, you will be able to view your grades through Laulima before they are final on MyUH.

Anonymity Policy:

An "Anonymity Policy" will be administered for this class. I will assign a class roster number to

you on your first homework assignment. After your first homework, use your roster number for your name on each of your homeworks and exams.

Exams

There will be four Midterm Exams. Each will be 50 minutes long, given during regular class periods, to test you on material from the course. All Midterms will be worth the same number of points. The Final Exam will cumulatively review all of the midterm material as well as the remainder of the course. It will be worth the same amount of points as the Midterms.

Exam dates are listed on the course calendar.

- Each exam will have **two parts, Part A** and **Part B**. **Part A** will be a multiple-choice section what will contain material from the previous exam. **Part B** will have word problems similar to homework as well as some multiple choice. **Part B** will consist of from the more recent chapters. The "more recent chapters" are shown on the course calendar.
- You are allowed to bring 1 sheet of handwritten notes (no printouts or photocopies) to Midterms #1 and #2. For Midterms #3, #4 and the Final Exam, 2 sheets are allowed. Your sheets of paper can be no larger than 8.5×11 inches. You can use BOTH sides of each sheet. You will be allowed to retain your "cheat sheets" after each exam to build upon for later exams.
- Do NOT let your "cheat sheets" become a substitute for learning formulas and practicing problems! (Graduate-school entrance exams, like the MCAT, do NOT allow open notes — you must memorize your formulas.)
- Midterm exams cannot normally be made up.
- You must attempt all four Midterms plus the Final Exam to avoid a failing grade in the course.
- Midterms and Final Exams will not be returned to you. Grades will be posted on Laulima, If you would like to view your results, please see me and/or make an appointment.

Homework

- Homework assignments and due dates are on the course calendar. They will be graded by our class grader or by me; please see me outside of class with any questions about grading.
- Turn in both an electronic version and hard copy version of the homework. I suggest making a photo copy of your homework with a digital camera and submit it through Laulima. The hard copy will be graded by the class grader
- Late paper homework will NOT be accepted for any reason after solutions for that assignment have been published online. This can occur anytime after lecture on the due date, but will usually happen one lecture later.
- For each of the assigned sections of our textbook, I recommend that you attempt as many additional chapter problems as your time permits. The small amount of assigned homework problems is NOT sufficient to fully develop your ability to solve physics problems..
- Brief answers to ~50% of end-of-chapter problems are embedded in the Web-based version of the text.
- Full worked solutions to ~15% of end-of-chapter problems appear in the free downloadable

Student Solution Guide that accompanies our textbook.

- The homework grade will be based on "Showing your work." The following is the format you should use in answering each question that requires a numerical answer. Some questions may require several concepts in which more than one equation is needed. Some questions with several parts may require only one equation applied several times. In such cases, it is not necessary to repeat the same work over again. Not all problems will require a quantitative result, such as graphing problems, or require an equation. If no equation is necessary, that state none is required. There may be special cases in which there is an actual equation. In such cases, changes will be pointed out during lecture. Here is an example of the format that should be used for "Showing your work."

Example for Homework Solution Format

Question
Calculate the velocities for t = a) 0.20 s, b) 0.50 s, and c) 1.0 s.

Physics Concept: Kinematics
Physics Equation: Average Velocity, $x_f = v\Delta t + x_0$

Answer: 5 m = v(0.20 s – 0.1s) + 0.
5 m = v 0.10 s.
v = 50 m/s (a)

5 m = v(0.5 s – 0.1s) + 0.
5 m = v 0.40 s.
v = 13 m/s (b)

5 m = v(1.0 s – 0.1s) + 0.
5 m = v 0.90 s.
v = 5.6 m/s (c)

Comments of Format: The "Physics Concept" is usually the chapter title or sub-chapter title. The "Physics Equations" are the formulas found in the textbook or my lecture notes. The "Physics Equations" may be rearranged. The equation I wrote here is not shown the same way on the online text book. The equation I have here is Equation 2.5 in a boxed section found in Chapter 2.3: *Time, Velocity and Speed*. Note that this problem was several parts, but the all require the same formula. However, I repeated the calculation for each part. If more than one equation is needed, than write out a list. Lastly, I used the appropriate number of significant figures for my final solutions.

Reading Assignments
Reading assignments are listed on the course calendar. The chapters listed are the planned chapters that I will review. It is advised that you read ahead and come to class prepared. You will find that reading ahead and using lecture as a review is an effective way of learning new material. There is a lot of material and the content is dense; absorbing the information is not the same as the information you get from popular media.
Lecture is primarily a review with some tips on solving homework problems. Most of the important formulas, concepts, and vocabulary related to each topic will be highlighted, and their correct applications will be demonstrated. I recommend that you skimread a bit ahead of our current lecture topic, then go back and reread more carefully after lecture. Reading assignments are particularly valuable because they contain additional worked example problems beyond those of our in-class tutorials and homework assignments.