Physics Department, California State Polytechnic University, Pomona

Physics 132

Section 1

Winter 2007

Professor A. John Mallinckrodt
Office: Bldg. 8, Room 223
Phone: 869-4054
FAX: 869-5090
email: ajm@csupomona.edu
web: www.csupomona.edu/~ajm/

Course Description: Physics 132 is the second course of a three-quarter, calculus-based introductory sequence in physics. This quarter the primary topics are oscillations and waves, gravitation, fluids, and thermal physics.

Conditions of enrollment: Math 115 (Calculus II), Physics 131L (General Physics Lab), and a C- or better in Physics 131 (General Physics) are prerequisites for all students enrolled in this course. Math 116 (Calculus III) and Physics 132L (General Physics Lab) are corequisites.

Text: *Physics for Scientists and Engineers*, 6th Ed., Volume 1, by Serway and Jewett.

How to get help: In general, if you catch me in my office or in the hall and I'm not preparing for or on my way to another appointment I will be happy to answer your questions. My office hours are Mondays 1:15-2:15, Wednesdays 3:30-4:30, and Fridays 10-11 and 1:15-2:15. You can also take advantage of the (free) physics department tutoring center in Bldg. 8, Room 157. I will be in the tutoring center on Tuesdays from 3:00-3:50. You can also come to see me during my Physics 132 lab that meets Tuesdays 4:00-6:30 and alternates each week between rooms 7-240 and 4-1-565 as long as you recognize that I will need to attend to my lab students' needs first. If you can't come during any of these hours, I will be happy to try to make an appointment with you for another time. For me, *the* most enjoyable aspect of teaching is working with students one-on-one. *Please, please, PLEASE* come see me often.

Note: The physics department welcomes students to take advantage of *any* faculty member's posted office hours whenever they are not being used by the faculty member's own students.

Email list: The University provides an email list including the campus email address of each student in the class. I will use it to communicate with you as needed between class meetings so be sure that you have set up the forwarding as necessary to make sure that messages sent to your "csupomona.edu" address actually get to you.

I encourage you also to use the email list to broadcast questions and comments related to the course, particularly those related to homework problems and textbook readings. I will monitor the discussion and contribute myself when I feel it might be useful.

To send messages to the list, address them to phy13201@csupomona.edu

Preparation, Attendance, and Participation: Class meetings are MWF 11–11:50. Preparation for class, attendance, and, especially, *active* participation will be rewarded both directly through a relatively minor "Bonus" component (see later sections) and indirectly through their far more significant and desirable effect on Exam scores. I have included a detailed schedule of topics with this syllabus along with the readings to be studied *before* each class meeting.

Homework: It is often difficult for beginning physics students to appreciate that the primary purpose of assigned problems in physics is *absolutely not* to see if you can "get the right answer." Rather, it is for you to practice and then demonstrate that you have learned 1) how to *determine* the fundamental physical principles that are involved in a described situation and 2) how to *apply* those principles in a *disciplined* and *orderly* fashion. Of course, if you have learned how to do these things, you should expect to get the right answer too, but that is—*really*—of secondary importance. You will find that, given time, an open book, lots of worked examples, and knowledge of the correct answer, it is very often possible to "get the answer" without the slightest understanding of what you are doing. Please guard against this; it is a *complete* waste of *your* time because it does not prepare you for and it obviously will not work on Exams.

Accordingly, I am not—and *you* should not—be satisfied with problem "solutions" that simply consist of a series of mathematical manipulations leading to a result. Instead, your problem solutions should be "presented." By this I mean that they should be readable by someone who does not have access to the problem statement; should include written explanations and thoughtful comments about *what* you are doing and, especially, *why*; should use well-defined and consistent notation (employing unique and meaningful subscripts and superscripts as necessary); should be accompanied by neatly drawn and carefully labeled diagrams; and should flow in a logical and orderly progression down the page.

They should use more space for the written explanatory information than for the mathematics! They should *not* include lengthy, multiple-step, purely *mathematical* manipulations because it only serves to *obscure* the *physics.* Do this kind of work on scratch paper and simply say something like "solving this equation for *v*, substituting the result into the equation for *F*, and simplifying we obtain…"

I will assign several problems that I urge you to work on and try to complete before each class meeting. The questions that will inevitably arise as you work on these problems will help focus your attention both on your reading in the text and what goes on in class. We may occasionally discuss aspects of these problems and you will be far better able to take advantage of such discussions if you are keeping up. You will turn in a homework assignment consisting primarily of these problems for credit approximately once per week at the *beginning* of class.

Each assignment that you submit will be graded on a 4 point basis with 4 meaning that the problem set appears to be *exceptional*—complete, *very* well presented, and mostly correct; 3, good – at least nearly complete, clearly presented, and pretty much correct; 2 – incomplete *or* not very clearly presented; 1 – not a good faith effort. Please see the examples of problem solutions at each level that I have posted on the class web site. Unsubmitted problem sets will receive a 0.

Because there is no curve in this class, you *will* benefit from working cooperatively with others on *all* aspects of the course and I *strongly* encourage you to do so including *discussing* the specific details of how to solve Homework Problems. The *written* work that *you* turn in, however, must be *yours alone*, based on the understanding *you* have acquired. When faced with two submissions that show signs of copying on *any* problem, I will conclude that at least one person hasn't done the work. In such cases *both* papers *will* receive no credit for the *entire* assignment.

I do not accept late Homework Assignments (and remember that they are due at the *beginning* of class), but, in order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out your two lowest Homework Assignment scores.

Reading Memos: Before each class meeting you are responsible for studying the text sections assigned for that meeting (see the schedule). For each reading assignment I ask you to produce a "Reading Memo." Reading Memos need not be lengthy—they may generally consist of a single side of a single page—but they must include the following items:

1 At the **top right hand corner** of the page: Your name, the date, and the reading assignment (*e.g.*, "1.1-7 & 2.1-3")

2 A table listing a) the *names* of all new measurables (i.e., physical quantities like velocity, energy, mass, etc.), constants, or units (SI or non-SI) that were encountered, b) the item type (one of *four* possibilities *only*: "measurable," "constant," "SI unit," or "non SI unit"), c) the *symbol* used to stand for the item, d) the *SI units* of the item if it is a measurable or its *SI value* if it is a constant or a unit, and e) the *dimensions* of the item in terms both of the names of other convenient measurables and *finally* in terms of the four fundamental dimensions—mass (M), length (L), time (T), and temperature (θ)—in terms of which the dimensions of *every* physical quantity and unit we will encounter this quarter may be expressed. Examples:

name	***type***	***symbol***	***SI units or SI value***	***dimensions***
angular frequency	measurable	ω	$\frac{\text{rad}}{\text{s}}$	$\frac{1}{\text{time}} = \frac{1}{\text{T}}$
Boltzmann constant	constant	k	$1.38 \times 10^{-23}\ \frac{\text{J}}{\text{K}}$	$\frac{\text{energy}}{\text{temperature interval}} = \frac{\text{M} \cdot \text{L}^2}{\text{T}^2 \cdot \theta}$
pascal	SI unit	Pa	$1\text{Pa} = 1\ \frac{\text{N}}{\text{m}^2} = 1\frac{\text{kg}}{\text{m} \cdot \text{s}^2}$	$\frac{\text{force}}{\text{area}} = \frac{\text{M}}{\text{L} \cdot \text{T}^2}$
British thermal unit	non SI unit	BTU	$1\,\text{BTU} \approx 1055\,!\text{J}$	$\text{energy} = \frac{\text{ML}^2}{\text{T}^2}$

3 Comments, reactions, and puzzling things as they occur to you during your reading. For instance, you might
   1) point to something in the reading that helped you make sense of something else that you knew about but didn't understand before **and** *explain how your understanding has improved.*
   2) point to a specific sentence (or figure or equation or any other item) that you didn't understand **and** *explain in a sentence or two specifically what it is that you don't understand or why you feel confused.*
   3) point to some sentence or paragraph that you thought was particularly important **and** *explain why*.
   4) point to some assertion or result that you think is a mistake or something that is misleading **and** *explain why you think so*.

Please understand, I am *most definitely not* looking for "notes on" or a "summary of" the reading assignment; "notes" can and often are compiled in a far too passive, "mind off" fashion. I *am* looking for evidence that you have *actively* engaged your mind while studying.

Reading Memos are due at the *beginning* of the class. As you enter the classroom each day please place your Reading Memo for the day on the lecture table. I will collect all Reading Memos a few minutes after the start of the class to allow for *slightly* late arrival.

Your Reading Memos will be graded on a 2 point basis with 2's reserved for those reading memos that show a significant effort to grapple with the material; 1's indicating a satisfactory level of effort; and 0's given to missing or insubstantial efforts. I strongly encourage you to appeal the scoring of any reading memo. I may very well change my mind about your score, but even if I don't, we will have a useful discussion! In order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out your three lowest or missing scores.

Bonus: A small bonus is determined by my overall evaluation of your work in the class. Although it is subjective, my policy is that, if it is used at all, it can *only* increase your grade; it allows me to reward students who make contributions to the class that may not be fully recognized, who make particularly effective use of office hours, or who, in any other way, seem to deserve a bit of *additional* credit.

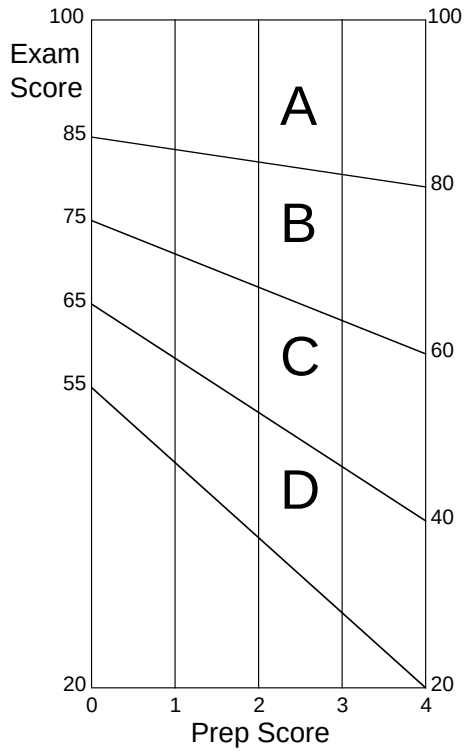
Examinations: There will be one Midterm Exam and a Final Exam. Your overall "Exam Score" will be given by

$$\text{Exam Score} = \begin{cases} 100\%\ \text{Final}, & \text{if Final} > \text{Midterm} \\ 50\%\ \text{Midterm} + 50\%\ \text{Final}, & \text{if Final} < \text{Midterm} \end{cases}$$

This policy is intended to allow for 1) a "bad day" on either the Final or the Midterm or 2) entirely missing the Midterm. (Note however that *taking* the Midterm should definitely *not* be considered "optional"; it is both good practice for the Final *and* insurance against a disappointing performance on the Final.)

I endorse and adhere to University policy as stated in the catalog and encourage my fellow faculty members to do the same: "If [a student has three final examinations scheduled for the same day], the student has the liberty of asking the professor of the *middle* exam to pick a mutually convenient time for the exam."

Important: Please notice that ***the final examination in this course is scheduled for the last day of finals week***. Make sure that you plan your personal schedule accordingly as I will not change the time simply to accommodate early travel plans.



Grading: I *do not* grade on the curve, so there is a tremendous advantage to be gained from working productively with your classmates. I will combine your Homework, Reading Memo, and Bonus scores with Homework weighted twice as heavily as the other elements into a single "Prep (Preparation) Score" on the same 4-point scale.

My philosophy on grades is as follows: I want to insure that solid, good faith *effort* in the course is rewarded with a passing grade while reserving higher grades—especially A's—for demonstrated achievement on Exams. Accordingly, your grade will be based on your "Exam Score" with increasingly liberal breakpoints based on your "Prep Score" at the lower grade levels as indicated in the graph above right. This graph represents *guaranteed minimum grades*; I reserve the right to alter the breakpoints downward (i.e., in your favor) should there appear to be a good reason to do so.

Academic Integrity: Please make sure that you have read and fully understood the statement on academic integrity that appears in the University catalog. My sincere desire is to act as facilitator—not an enforcer!—for your studies in physics. Accordingly, I operate on the assumption that all of our interactions are based on openness, honesty, and good faith. I expect all of us to be honest and to treat each other fairly and with respect. Because our trust in each other is absolutely *crucial* to the effectiveness of our relationship, I take an uncompromising stance, as should you, on the necessity for sanctions when it is violated.

Emergency Procedures: All students are responsible for being aware of the College of Science Emergency Procedures. Please take a moment to read them at http://sci.csupomona.edu/student_info/emergency_procedure, which is also linked to from the course home page.

Course Schedule:

Date	*Read Before Class*	*Topics/Events/Notes*
1/3	—	Introductory remarks, Syllabus review, *Newtonian gravity*
1/5	13.1-4	
1/8	13.5-7	
1/10	14.1-4	*Fluids*
1/12	14.5-7	**PS#1 due**
1/15	—	**Academic Holiday**
1/17	15.1-3	*Oscillations*
1/19	15.4-5	**PS#2 due**
1/22	15.6-7	
1/24	16.1-2	*Waves: General*
1/26	16.3-6	**PS#3 due**
1/29	17.1-3	*Waves: Sound*
1/31	17.4-6	**PS#4 due**
2/2	18.1-3	*Waves: Interference*
2/5	18.4-6	**PS#5 due**
2/7	—	**Midterm Exam**
2/9	18.7-8	
2/12	19.1-3	*Thermodynamics: Temperature*
2/14	19.4-5	**PS#6 due**
2/16	20.1-3	*Thermodynamics: Work, Heat, and Energy (The First Law)*
2/19	20.4-5	**PS#7 due**
2/21	20.6-7	
2/23	21.1-2	*Thermodynamics: Kinetic Theory of Gases*
2/26	21.3-4	**PS#8 due**
2/28	21.5-7	
3/2	22.1-2	*Thermodynamics: Heat Engines and Entropy (The Second Law)*
3/5	22.3-4	**PS#9 due**
3/7	22.5-7	
3/9	22.8	**PS#10 (not to be turned in)**
3/16	—	**Final Exam** (Friday, 11:30-1:30)