

Physics Department, California State Polytechnic University, Pomona



Physics 123 Section 1 Spring 1999

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

Course description: Physics 123 is the final course of a three-quarter, algebra-based introductory sequence in physics. This quarter the primary content concerns electric and magnetic phenomena (“E&M”), the physics of high relative speeds (“relativity”), the physics of submicroscopic phenomena (“quantum physics”), and two applications of quantum physics—the physical properties of atoms and of atomic nuclei (“atomic and nuclear physics.”)

Conditions of Enrollment: Physics 122 and 142L are prerequisites for all students enrolled in this course. Physics 143L (College Physics Lab) is a corequisite.

Text: *Physics*, 4th Ed., by Cutnell and Johnson

A few words about teaching and learning: You can learn by yourself, but no one can teach you without your help, so I don’t promise to *teach* you anything. I *do* promise to do my best to uphold my part of the bargain.

My part of the bargain: I have two responsibilities, both of which I take very seriously. The first—which I thoroughly enjoy—is to provide you with a clear, effective, and efficient path to learning the subject matter of this course. The second—which I don’t enjoy so much—is to carefully and honestly evaluate your level of achievement. Toward both of these ends I bring nearly thirty years of experience in and study of what helps when learning physics, what is reasonable to expect you as college students to do, and what is reasonable to expect you to accomplish.

Your part of the bargain: Your primary responsibility is to follow conscientiously the path that I provide. That path requires significant effort, but you will find the results to be *very* rewarding.

Physics is *not* a spectator sport and *no* amount of listening to lectures, however clear they may be, can replace thoughtful study and routine practice. Furthermore, this course covers a *lot* of material and new material relentlessly assumes an understanding of and builds on previous material. Accordingly, the work you do *between* class meetings is the heart and soul of the course. I have included a detailed schedule with this syllabus that specifies the material to be studied *before* class. In addition, you will have a regular daily assignment and frequent assigned problem sets. The bottom line: Your part of the bargain (like mine) will require at least several hours of productive work before each class meeting.

Please keep all of your problem sets and class notes, quizzes, exams, and any handouts I distribute in a notebook that you bring to class along with the textbook each day.

How to get help: My office hours are Mondays 2-3, Wednesdays 2-3, and Fridays 11-12. In addition, I will be in the physics tutoring center (3-205) on Fridays from 2-3. You are also welcome to come see me during my lab on Monday afternoons from 3 to 5:30 as long as you understand that questions from my lab students will always take precedence. If you can’t come during any of these hours, I will be *happy* to make an appointment with you for another time. For me, one of *the* most enjoyable aspects of teaching is working with students one-on-one and clearing up specific problems. *Please* come see me often.

Problem Sets: I will assign about 20 problems from each chapter. These will be your best indication of the material that I want to emphasize and the level of understanding that I expect you to attain. Furthermore, working out solutions to these problems is probably about the bare minimum of practice on your part that is likely to yield that level of understanding. I will ask you to turn in some of these in problem sets that will be due approximately once a week.

The 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 each 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, I fully expect that you will get the right answer too, but that is of *decidedly* secondary importance. Furthermore, it is often possible—given time, an open book, lots of worked examples, and knowledge of the correct answer—to get the right answer without the slightest glimmer of true understanding. Guard against doing this; it is a thorough waste of time because it doesn't prepare you for and it will not work on exams.

Accordingly, I am not interested in problem “solutions” that simply consist of series of mathematical manipulations leading to a numerical answer. Instead, the problem solutions you submit are to 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, should use well-defined and consistent notation, should be accompanied by neatly drawn and carefully labeled diagrams, and should flow in a logical and orderly progression down the page. They should *not* include sequences of algebraic manipulations; *e.g.*, when three equations are to be solved for three unknowns, simply say something like, “Solving equations 1,2, and 3 for x, y, and z, we obtain ...” and give the result!

A grader will look over your work and assign a holistic score of 1 to 4 with 4 meaning that the problem set is *exceptional*—complete, *very* well presented, and at least mostly correct; 3, good – at least nearly complete, clearly presented, and mostly correct; 2 – incomplete or not very clearly presented; 1 – not a good faith effort. (Please see the sheet I will hand out with examples of solutions that merit the various scores.) Unsubmitted problem sets will receive a 0. I do not accept late problem sets, but, in order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out your two lowest problem set scores.

I *strongly* encourage you to form study groups and to discuss with others your readings, questions that come up in and out of class, and how to go about solving problems. The work *you* turn in, however, must be *yours*, based on the understanding *you* have acquired. When faced with two write-ups that show any signs of copying, I conclude that at least one person hasn't done the work. In such cases *both* papers *will* receive no credit.

Quizzes: There will often be brief (~3-5 minute), unannounced, closed-book quizzes usually given at the *beginning* of the class period. Quizzes will test only for a basic understanding of recent material and for a minimal level of comprehension of the day's assigned pre-class study. They will be scored on the same 4 point scale as the problem sets with the following meanings: 4 – no significant errors, you are clearly on top of things, 3 – minor errors, but basically O.K., 2 – substantive errors, this material needs immediate attention, 1 – no evident preparation or practice on material, serious trouble. Missed quizzes will receive a 0. In order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out your two lowest quiz scores.

Course Involvement and Subjective Evaluation: Some of class time will be conducted in a participatory fashion that will require you to have completed daily assignments beforehand. A small portion of your grade, assigned on the same 4 point scale, will be determined by my own subjective impression of your involvement in the class as evidenced through attendance, preparation, class participation, and office visits. Most of you will likely receive a 3 (meaning O.K. to good) with other scores reserved for clearly “distinguished” levels of involvement.

Examinations: There will be an in-class midterm, an optional evening exam, and a final exam. The in-class midterm will by default count for 1/3 of your overall exam score and the final exam for the other 2/3. If you wish, however, you may take the optional midterm in a two hour evening session on Wednesday, 12 May. In that case—and only *if* it helps your overall grade—the midterm and the practice exam will count equally for 1/2 of your exam grade and the final for the other half.

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 problem set, quiz, and subjective scores with relative weights of 3, 2, and 1 respectively into a single “effort” score on the same 4 point scale . Grades will then be assigned using the following grid:

		-----Exam Score-----				
		Excellent 80% - 90%	Good 66% - 80%	Satisfactory 52% - 66%	Substandard 40% - 52%	Unsatisfactory 25% - 40%
Effort Score	4	A	A-	B+	B-	C
	3	A	A-	B	C+	C-
	2	A-	B+	B-	C	D
	1	B+	B	C+	D+	F
	0	B+	B-	C	D	F

(All grades reflect the midrange and are ± roughly one step)

The grid is intended to insure 1) that solid effort in the course will *insure* a passing grade and 2) that demonstrated achievement (on exams) is the *only* pathway to superior grades. Because of the simple fact that physics *can not be learned* without substantial effort and practice, there is a strong correlation between effort and exam scores and most students end up in the unshaded area of this grid. It has overwhelmingly been my experience that good effort (>2.5) leads to good performance on exams and course grades of A or B. It has also been my experience that a lack of effort (<1.5) leads to extremely poor performance on exams and course grades of D or F.

Academic Integrity: Please be aware of the statement on academic integrity in the University catalog. My strongest desire is to act as facilitator for your studies in physics. Accordingly, I operate on the assumption that all of our interactions are based on honesty and good faith. I have no desire to act as policeman, just as *you* should not have to be concerned about being treated fairly and with respect. Because our trust in each other is crucial to the effectiveness of our relationship, I take an uncompromising, zero-tolerance stance on the necessity for sanctions when it is violated.

Course Schedule:

<i>Date</i>	<i>Before class</i>	<i>Topics/Events</i>
3/29	(none)	Intro, Electrostatics
3/31	18.1-5	Coulomb's Law
4/2	18.6-8	The Electric Field
4/5	18.8	Gauss' Law
4/7	19.1-2	Electric Potential and Potential Difference
4/9	19.3-4	Point Charges and Equipotentials
4/12	19.5-6	Capacitors
4/14	20.1-4	Emf, current, and resistance
4/16	20.5-10	Equivalent resistance
4/19	20.11-14	"RC" circuits
4/21		Midterm Exam
4/23	21.1-4	Magnetic Forces
4/26	21.6-8	Magnetism and current
4/28	21.10-11	Magnetic materials
4/30	22.1-4	Induced emf
5/3	22.5-7	Applications
5/5	22.8-9	Inductance
5/7	23.1-3	AC circuits
5/10	23.4-5	Resonance
5/12	24.1-3	Electromagnetic Waves Optional Evening Exam (6-8PM)
5/14	24.4-6	Electromagnetic Energy, Doppler Effect, and Polarization
5/17	28.1-3	Postulates of Relativity and Time Dilation
5/19	28.4-7	Other relativistic effects
5/21	29.1-3	Waves and particles
5/24	29.4-6	The uncertainty principle
5/26	30.1-4	The Bohr atom
5/28	30.5-9	The Quantum Atom, Lasers, and Applications
5/31		No class meeting (Memorial Day)
6/2	31.1-5	Nuclear structure and decay
6/4	31.6-9	Radioactivity
Wednesday, 6/9		Final Exam(9:10 - 11:10)