Physics 2010 General Information

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Office hours: 8:00–8:50 daily, 10:00-11:00 MWF. I will often be available at other times as well; feel free to make an appointment in advance if you like.

Required text: Urone, *College Physics*, Second Edition (Brooks/Cole, 2001). Daily Reading assignments are indicated by chapter and section number on the schedule. However, you don't necessarily need this exact book; if you have a different book intended for a "college physics" course, you can probably get by with it.

Required materials: You will occasionally need a clear plastic ruler and protractor; please purchase these immediately if you don't already have them. You will also need a "scientific" calculator (i.e., one that can handle trigonometric functions, exponential notation, and so on). Good scientific calculators can be purchased for as little as $10.00. The advanced features of the more expensive models will not be needed in this course, though you might find their larger displays helpful. A simple calculator that you feel comfortable using is better than a fancy calculator that you don't know how to use. On quizzes and tests you will usually be allowed to use a calculator to do arithmetic, but not to store information. You may not use a Palm Pilot or other similar device (capable of storing text information) on quizzes or tests. If you are in doubt about what types of calculators are permitted, please ask.

What is Physics?

Physics is the study of the most fundamental laws of nature: the laws of motion, heat, light, gravity, electricity, and subatomic interactions. As such, physics is the foundation upon which all the other sciences (chemistry, geology, astronomy, biology) are built. Start with any scientific fact, ask "why" over and over again, and the answers will always lead you to the laws of physics.

By the same token, in physics we tend to avoid the complexities of the real world, in order to focus on the fundamental principles. This practice is both a blessing and a curse! The blessing is that we needn't confront all the complexities of nature at once: When a problem is too complicated, we can just send it over to the chemists or the biologists or the engineers! The curse is that the examples we work with tend to be unrealistically simple and often abstract: The relevance to complicated, real-life situations is often hidden. Part of our job in this course is to learn how to see through the complexities of nature and perceive the hidden simplicity of the underlying physical laws.

Course Overview

For a topical outline of the course, please refer to the schedule on the previous page, or to the table of contents of your textbook. (This semester we'll cover Chapters 1–16.)

But this course isn't just a long list of topics. Really it's about a much smaller number of Big Ideas. In fact, I can distill the whole course down to just three Big Ideas:

1. **Forces Cause Acceleration.**
2. **Energy and Momentum are Conserved.**
3. **Entropy Tends to Increase.**

(Ok, perhaps that's four Big Ideas, since I combined two of them in the second line.) The first half of this course is a long, steady build-up to the Big Ideas of Acceleration, Force, Energy, and Momentum. We'll define these concepts carefully, develop our intuition for them, and apply them to the simplest types of situations. In the second half of the course, we'll continue applying these Big Ideas in more complicated and subtle contexts. The final Big Idea, Entropy, will not appear until the very last week of the course, but its fundamental importance compels me to include it in the list.

During the semester there will be many times when you feel lost among all the details. That's when you should return to this list of Big Ideas, read it aloud, shout it out the window, and think about how the example at hand fits into the big picture.

The topics of this semester fall under two of the major subfields of physics: mechanics (the study of motion) and thermodynamics (the study of heat). The continuation of this course, Physics 2020, treats the remaining major subfields: electricity, magnetism, optics, relativity, quantum mechanics, and nuclear physics. (Learning these subjects will entail learning a few more Big Ideas.)

Is this the physics course for you?

Like most universitites, Weber State offers three different introductory physics courses. The most advanced of the three is Physics 2210-2220, intended for students who wish to become engineers or research scientists (at the PhD level). Some of the more prestigious medical schools also require or recommend this more advanced course. The least advanced of the three courses is Physics 1010, which is a one-semester overview of physics at a mostly conceptual level, with minimal use of mathematics.

This course, Physics 2010, is the first half of a two-semester sequence intended mainly to prepare students for careers in the health professions and other fields where a firm understanding of basic physics is essential. The idea is that you probably won't become an independent scientific researcher, but you *will* be working among scientists or others who will use the concepts and language of physics. You'll need to understand these concepts, and critically evaluate what you hear and read, in order to do your job correctly. If you're planning a career in the health professions, then your correct understanding of physics concepts may be a matter of life and death.

Goals of the Course

The main goal of this course is summarized in the previous paragraph. That is, our goal is to prepare you for a career in which you will encounter physics in the workplace and need to understand enough of it to avoid serious (even life-threatening) mistakes. Still, we realize that you probably do not intend to become a professional physicist. Because you can always consult experts or reference works when difficult questions arise, our goal in this course is to get you to the point where you will understand what the experts and reference books are saying, interpret it correctly, and apply it to your own work.

In practice, this means that we need to focus on *concepts* and *calculations*. Concepts are important because you don't want to use one word when you mean another (for example, force is not the same thing as energy). Calculations are important because if you don't get the right numerical answer, your job (or even someone's life) could be at stake. So the homework, quizzes, and tests in this course will be designed to develop (and test) both your conceptual understanding and your facility with calculations. Verbal and numerical answers will be equally important.

Policies and Procedures

Class sessions will be spent on lecture, demonstrations, example problems, and discussion. *Please interrupt me with your questions at any time.* Attendance is not required but is strongly recommended. I'm getting paid big bucks to teach this course, so I'll be presenting it with my own personal touches, not merely reading the textbook to you. If you have a cell phone or beeper, please set it to remain silent during class.

Problem sets will be assigned about once a week, as indicated on the schedule. The purpose of the problem sets is *not* to test you; rather they are an opportunity for you to practice and learn. I *strongly* encourage you to work with classmates on problem sets. In this way you can learn from each other, prevent careless errors, practice putting ideas into words, and work in an environment more like the "real world". Of course, in the end each of you will be tested individually, so it's best not to rely on classmates *too* much.

I will also make official **solutions** to the problem sets available on the course web site. You are free to consult these solutions at any time as you prepare your own. However, I recommend that you use them only to *check* your own solutions, and when you are truly stuck. In any case, all work that you turn in must be in your own handwriting.

I will not take the time to read your problem solutions in any detail. Grading will be based mostly on the amount of work completed and the apparent effort expended. It is important that you turn in full solutions, with verbal explanations wherever appropriate (see the official solutions for examples). I will not simply count the number of correct answers. A problem set that is at least 80% complete will receive a score of 2; one that is between 50% and 80% complete will receive a score of 1; and anything less than that will receive a score of zero.

Late homework will not be accepted. However, your homework grade will be based only on the highest 13 (out of 15) problem set scores, so you may miss two problem sets without penalty. This policy should give you enough flexibility to deal with most illnesses, family emergencies, term papers, unexpected romances, and the like; exceptions will be granted only in the case of very serious illness or other long-term crisis, and then only if you contact me as soon as possible.

Quizzes will be given at the end of class on the same dates that problem sets are due. Each quiz will consist of one or more questions covering the same topics as that day's problem set. Before each quiz we will have a half-hour question-and-answer session to discuss the homework and prepare for the quiz. No make-up quizzes will be given, but again I will drop the two lowest scores in computing your final grade. All quizzes will be closed-book with no notes allowed. Calculators will sometimes be permitted for doing arithmetic, but not always.

We will have four **midterm tests**, given in class. Like the quizzes, they will be closed-book with calculators permitted only for doing arithmetic.

The **final exam** will be like the midterms but longer, covering all the material of the course (with an emphasis on the last three weeks). It will be given on Monday, May 3, at 7:00 a.m.

No make-up exams will be given without *advance* permission.

Grades will be computed according to the following weights:

problems sets (highest 13)	8%
quizzes (highest 13)	12%
lab work	20%
four midterms @10%	40%
final exam	20%

Before applying these weights, I will scale each separate score according to a different "curve." The curve for quizzes and tests will normally assign a $C-$ to a score of 50%, with other grades distributed accordingly. The curve for homework is more stringent, with a $D-$ assigned to a score of 60%. The curve for lab work will be different for each lab instructor, in order to cancel out differences in instructors' grading practices.

In deciding borderline grades I may also consider class attendance and participation. (It is your *effort* at participation that matters; how much knowledge you demonstrate makes no difference at all.)

Academic dishonesty, though rare, occasionally does occur in physics classes, so the following policies are necessary. Dishonesty on an assignment or quiz will result in a zero grade for that item on the first occurrence and failure in the course thereafter. Dishonesty of any sort on a test, if clearly documented, will result in automatic failure in the course. In serious cases, evidence of dishonesty may also be presented to the appropriate hearing committee for possible further sanctions.

Special notice: Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in room 181 of the Student Service Center. SSD can also arrange to provide course materials (including this syllabus) in alternative formats if necessary.

Hints and Suggestions

Physics is somewhat different from most other subjects, so you may need to modify your study habits in order to succeed in this course. Here are some suggestions on how to earn the highest possible grade, and more broadly, on how to get the most out of this course:

- **Come to class.** Arrive on time, stay awake, and pay attention. Take notes, but not so many that you don't have time to think.
- **Do the homework.** Plan to spend several hours on each assignment. This is where most of the real learning takes place in a physics course. Don't look at my solutions until after you've done all you can on your own (or with classmates).
- **Read with a pencil.** Highlighters are for courses that are based on rote memorization, and physics is not such a course. With a pencil you can still underline but also write notes, questions, and calculations in the margin.
- **Don't procrastinate.** Even if you can "cram" for tests in your other courses, it probably won't work in physics.
- **Ask questions.** The very act of formulating a question can help enormously. Ask questions during class. Come to my office and ask me questions there. Send me questions by email. Ask questions of your classmates while you study together.

Although physics has a reputation for being hard, all of you are capable of doing all of these things, and it's extremely rare for a student who does these things not to succeed in physics. So try not to worry too much about your grade in this course.

Good luck, and welcome to physics!