Physics 112 – Syllabus and Information Sheet
Fall 2001

"Large-room" meetings [lectures]: MWF 12:10 – 1:00 PM in Room 5, Physics Hall
"Small-room" meetings [recitations]: Thursday (individually scheduled)
Instructor: David Meltzer
Office: 17 Physics; **Phone:** 294-9358; **e-mail:** dem@iastate.edu
Office Hours: 1-2 PM, M, F or by appointment
Textbook: none required. On reserve for reference: *Physics*, 5th edition, by D. Giancoli; *Physics*, 4th edition, by J. Cutnell and K. Johnson.
Required Materials: (1) *Workbook for Introductory Physics* by D. Meltzer and K. Manivannan; available at ***Copyworks*** (Bin #242); (2) *Physics: A Contemporary Perspective*, Vol. Two, preliminary edition, student workbook, by Randall D. Knight (available at University Bookstore); (3) Supplementary lab manual (from *Tutorials in Introductory Physics* by McDermott et al.), at ***Copyworks***, Bin #136.

A. Class Attendance and Activity

All students are expected to attend class. In the case of an absence from the classroom, the student will be held accountable for the material covered in class.

Most class time will be taken up by various student activities, such as group work on problems and questions. Relatively little time will be spent on lecture. I will frequently ask for student responses to questions and problems, through the use of "flash cards." One of the purposes of this is to let the instructor know how well the subject matter is being communicated to the students, so that he may adjust the pacing of the discussion accordingly. All students who attend class are **required** to participate in these in-class activities.

B. Grading Policy

1. Students may bring one sheet (8.5" × 11", both sides) to use on all exams and ***most*** (not all) quizzes. *If a note sheet will not be permitted on a quiz, this will be announced well in advance.* All exams and quizzes will be "cumulative," and may include material from *any part* of this course. Quizzes will sometimes contain material from *that day's* class. Most questions will be "short answer" and/or "multiple choice."

2. There will be **quizzes** every Monday and Friday. Quizzes may contain material that has been assigned for home study, but has *not yet been covered* in class. The top ***twenty*** quiz grades will be counted; there will be *no* make-ups for quizzes (except in very special situations). Quizzes are worth 10 points each; Total: 200 points.

3. There will be **three in-class exams** during the semester; all three exams will be counted. These exams are worth 50 points each. Total: 150 points. [If you miss one of the in-class exams, you will have to take a cumulative make-up exam at the beginning of Finals week.]

4. **Homework** will be assigned and graded; homework is due at the beginning of your recitation section. Homework that is not handed in within 5 minutes of the beginning of the recitation will receive a maximum of half credit. Total value of homework: 100 points.

5. **Class quizzes:** These will usually be given on Wednesdays. Grades based on performance of whole class. Total: 50 points.

6. **Final Exam (mandatory):** You must take the final exam at the scheduled time. Total: 100 points.

7. **Lab:** You are required to complete **all** lab experiments satisfactorily to pass the course. Questions related to the lab will appear on exams and quizzes. Outstanding performance in the lab (as determined by the lab instructor) may be a weighting factor in borderline cases.

C. Scaling of Grades: The grade will be based on the total points accumulated, with the following letter equivalents (Plus and minus grades to be determined later):

A: 550; B: 480; C: 420; D: 360; F: 359 or less.

I reserve the right to lower the above scale, on a class-wide basis, if deemed appropriate. That is, if you hit the above minima, you're guaranteed to get **at least** the specified grade.

Tentative Syllabus and Schedule

August 27: Introduction; August 29, 31: Review of Gravitation; Electric Charge and Electric Force

September 3: Labor Day Holiday; September 5, 7: Electric Field

September 10, 12, 14: Electric Field/Electric Potential Energy

September 17, 19, 21: Electric Potential Energy/Electric Potential

September 24, 26, 28: Electric Potential, Capacitance, Electric Current

October 1, 3: Electric Current and Resistance

October 5: EXAM 1 (Covers Chaps. 1-4)

October 8, 10, 12: DC Circuits

October 15, 17, 19: DC Circuits

October 22, 24, 26: Magnetism

October 29, 31: Magnetism/Magnetic Induction

November 2: EXAM 2

November 5, 7, 9: Magnetic Induction

November 12, 14, 16: Electromagnetic Waves/ Wave Nature of Light

November 19-23: Thanksgiving Holiday

November 26, 28: Geometric Optics; November 30: Quantum Theory

December 3, 5: Photons and Atomic Spectra

December 7: EXAM 3

December 10, 12, 14: Nuclear Structure and Radioactivity

December 17-21: Final Exams

Physics 112, Fall 2001: Additional Information

Subject matter to be covered in this course: Most of this course will be devoted to phenomena related to the electrical properties of matter. Electric charge, electric current, and magnetic phenomena will be our starting point. Then, we will explore electromagnetic waves, including aspects of light and optics, which are fundamentally just another form of electromagnetic phenomena. Finally we will spend some time on "modern" physics topics such as atomic structure, spectroscopy, and nuclear physics.

Instructional methods: Although we will be meeting three times a week in the Lecture Hall (Room #5) I will not be lecturing very much at all. Instead, most of the time we spend in that room will be reserved for you to think through various questions and problems that I will present to you. I will expect you to read in advance through the Lecture Notes for that day's topic, and I will spend a few minutes during most classes briefly reviewing the material. But, the rest of the time, I won't say too much.

We'll have two main activities:

(1) I'll give you some questions with multiple-choice answers (most of these will come out of the Workbook), and ask you to spend a minute or so thinking about the question. Often, I'll ask you to discuss your answer with the people sitting next to you (or in front or behind you), to see if you agree on the answer. Then, I'll ask you to hold up a flash card with the answer you think is correct. In this way, I'll find out right away what all the students in the class are thinking about the question I asked. I'll know if most people were able to figure it out, or if a lot of people are confused about it and gave the wrong answer. That way I'll know if we need to spend more time discussing that problem.

(2) I'll ask you to start working on some of the problems in the Workbook that don't have multiple-choice answers. Although you'll be writing your own answers in your copy of the Workbook, I'll expect you to discuss your work with the people sitting next to you, to see if you agree on the answers. I (and sometimes, a TA) will be walking around the room while you work, "looking over your shoulder" to see how you're doing, and coming over to help if you raise your hand. Most of the time, the way I will help is not by giving you a direct answer, but by asking you some questions to help guide you toward the right answer.

On Monday and Friday, approximately the last 15 minutes of class will be spent on a written quiz. On Wednesday, we will usually have several "Class Quizzes" during class. These will be worth one point each, and everyone present will get the same grade (either one point, one-half point, or zero points, depending on how many people hold up the flash card corresponding to the correct answer). [If you miss a Class Quiz, you have one week to come to my office to make up the points by answering some similar questions.]

What's the purpose of this type of instruction? Learning physics is a lot like learning to play piano (or some other instrument), or basketball (or some other sport). There's only so much you can absorb just by listening to someone talk about it. Basically, you have to try it out yourself and get lots of practice doing it. Recently, physics instructors have been increasingly successful in helping students learn physics by using this type of "active learning" instruction. It can be hard and frustrating at times – just like learning a sport or a musical instrument – but I believe that you can learn a lot more this way than by listening to me lecture. You will find that during every class, and every recitation, you will be forced to think hard about physics, trying to puzzle out the solution to various problems, trying to explain your thinking to the people sitting next to you and trying to understand their own explanations of *their* thinking. Most people

who take this course end up enjoying this method of learning, although it can be very frustrating at first. A few people just don't like it, and prefer to be taught by a traditional lecture method.

Types of problems and questions: Many of the questions and problems we will work on – and that will appear on the quizzes and exams – will be qualitative, not quantitative in nature. The answers will not involve numbers, and you may be asked to give an explanation of your answer. Part of your grade will depend on the clarity of your explanation. The reason for this is that it is very important to get a good understanding of the basic concepts in this course, and not ***just*** to be able to solve quantitative problems. Sometimes it is easier to show (and test) your understanding of basic principles with non-quantitative questions. This type of question may often seem to be "tricky" if you don't have a thorough understanding of the material, so a major objective in this course will be to ***acquire*** a very solid understanding of the basic concepts. When you have that, most non-quantitative questions will seem fairly straightforward.

We will, of course, also do lots of quantitative problems similar to ones you've done in other physics courses. But we won't put a lot of emphasis on complex mathematical methods or problems that require lots of detailed calculations. Sometimes, I will ask you to solve a problem ***without*** using algebra, even though you might be able to work out a mathematical solution to the same problem. For most of the people in this class, a good grasp of the basic physical principles will probably be more important, in the long run, than the ability to carry out complex algebraic calculations.

Nature of Quizzes and Exams: Most of the questions on the quizzes and exams will be quite similar to the ones we practice in the Workbook. ***However,*** on each exam – and on some quizzes – there will be one or two problems that are ***completely different*** from anything you have seen. They can be solved if you have a very good grasp of the basic concepts, but they will require some creative thought on your part. These problems are ***intended*** to be particularly challenging.

How the Recitations will work: Most of the time in the recitations you will be working through problems in the *Workbook for Introductory Physics*, or in *Physics: A Contemporary Perspective,* consulting with your neighbors just as you have done in class. The TA's (and I, when I'm present) will be helping you by asking "leading" questions, asking you to explain your thinking, and guiding you in the right direction.

Comments on the labs: Most of the labs will be taken from the Lab Manual for the course, but several will come from the supplementary packet (Bin #136 at ***Copyworks***). These will be similar to the recitations, although here we will be using some lab equipment to help answer the questions.

Other issues: I place a very strong emphasis on academic honesty. I realize that for most people in this class this is not an issue, but I want to make it clear that I will not tolerate any incidents of academic dishonesty. Even a single instance will carry heavy penalties.