PHYS 2012 **General Physics II** **Fall 2008**

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Lecture: M,W,Th,F 12:00-12:50pm, MWAH 195.
Lab: 2 hours weekly in MWAH 241, as scheduled. Lab sections do not meet the first week of class.

Prerequisites: PHYS 2011, Calculus II (MATH 1297 or 1597). This course presumes genuine competency in differential and integral calculus.

Texts: Fundamentals of Physics, 8th ed. Halliday, Resnick, and Walker. Laboratory Manual for General Physics I-II (UMD Physics Dept.)

Catalog description: Calculus-based introduction to electricity, magnetism, and optics.

Objectives: The goals of the course are: to acquire both a conceptual understanding and a usable knowledge of fundamental physical principles in the areas of electricity, magnetism, simple electrical circuits, and geometrical and physical optics; to develop significant quantitative problem-solving skills in these areas through the application of these principles; and to gain practical experience in measurements and analysis of data through laboratory work.

Topics: Electrical nature of matter: charge, Coulomb's law, electric fields, electric fields from point and continuous charge distributions; applications of symmetry and Gauss's law. Energy and electric fields: electric potential, potential energy, energy storage and capacitors. Electric circuits: current, Ohm's law, single and multi-loop circuits, RC circuits. Magnetism: Lorentz force, current lops and magnetic dipoles; sources of magnetic fields, laws of Biot-Savart and Ampere; magnetic induction, laws of Lenz and Faraday; self- and mutual-inductance, transformers, RL circuits. Electromagnetic waves: Maxwell's equations and electromagnetic spectrum, electromagnetic energy and momentum. Geometric optics: reflection, refraction, image formation by mirrors and lenses. Physical optics: interference, diffraction. This corresponds to chapters 21-36 of the text, with chapter 31 omitted and chapters 32 and 33 treated selectively.

Grading: The course grade will be based on the following weighted contributions:

- Homework and quizzes – 25%
- Tests (3) – 36% (*tentative* dates, 9/26, 10/20, 11/24)
- Final Exam – 24% (Friday, Dec. 19, 2:00 PM. The exam will *not* be available earlier.)
- Lab – 15%

The letter grade scale will be: >86% = (A-,A); >74% =(B-,B,B+); >62%=(C-,C,C+); >54% = (D,D+)

Lab: Completion of all 12 lab experiments and submission of the lab notebook for each lab is a necessary but not sufficient condition for passing the course. Labs do not meet during the first week of classes. The last week of class will be a make-up week. A maximum of two excused absences from lab may be made up during make-up week. Excused absences are granted only for documented illness, family emergency, or required university-sponsored activity. The lab instructor must be notified in advance or as soon as practical in case of emergency. Lab instructors will announce the due date for lab notebooks, which will be typically 2-3 days after the lab is performed. Late lab notebooks will be penalized. Labs receiving an Unsatisfactory grade must be repaired and resubmitted for re-grading within 7 days of their return. All lab work, including make-up and repairs must be completed and submitted no later than 4:30 pm of the last day of regular classes. Having more than one lab with an Unsatisfactory grade remaining at the end of the semester will result in a failing grade for lab and the course. Students repeating the course must complete all lab work again this semester. Since each lab instructor may have slightly varying grading standards, the contribution of lab to the course grade will be scaled according to the overall average grade of your lab instructor.

Reading: Keep up with reading assignments! Not all topics in the text will be covered during lecture. Reading the text carefully for comprehension is important. When reading the text, you should read actively: that means have paper and pencil handy to make notes and to work through calculations and examples yourself, so that you understand the details. You're not reading a novel; reading the text with appropriate attention will take time and patience.

Homework: Success in this course will require extensive practice in applying the principles of physics presented to solving problems. A weekly problem set will be collected and a subset of collected problems graded. The lowest problem set grade will be dropped at the end of the semester. Follow the homework guidelines included below. Problem sets will be due at the *start* of class on the specified due date. *No late assignments will be accepted.*

Additional practice problems are essential: you should do all odd-numbered one-dot problems in the text as basic practice and other recommended practice problems before tackling the more sophisticated problems on problem sets. The more problems you do, the better prepared you will be for tests.

You are encouraged to discuss problems and work collaboratively. However, all final work submitted must be your own as an individual – not copied from a co-worker. Do not consult solution manuals. Answers derived from solutions manuals or other sources other than your own intellectual effort are unacceptable and constitute cheating. See the UMD academic integrity policy at http://www.d.umn.edu/assl/conduct/integrity/ and links to the Student Conduct Code can be found at http://www.d.umn.edu/assl/conduct/code/ .

Make-up work: There are no make-up options for missed problem sets or quizzes; the lowest problem set grade will be dropped. Make-up tests will be available only for documented medical or family reasons or mandatory university-sponsored events necessitating absence from class.

ABET: For the purposes of preparing for a regular review of engineering programs in Fall 2009 by the Accreditation Board for Engineering and Technology (ABET), samples of student work will be collected this semester to document course expectations and representative student performance. All identifying information will be removed so that the samples are anonymous. Anyone with concerns about this process should consult the instructor.

Individuals who have any disability, either permanent or temporary, that may affect their ability to perform in this class are encouraged to inform the instructor at the start of the semester. Adaptation of methods, materials, or testing may be made as possible to provide for equitable participation.

PHYS 2012 Homework Expectations

Homework must be presented in a format so another person can understand the logic and the individual steps of the solution. The final answer itself will carry little credit. The bulk of the credit will be assigned for presenting a clear and correct process of solving a problem. The solution must be presented in a systematic, step-by-step fashion, with brief explanations of what is being done and the reasoning involved. Your solution must make clear what the problem is asking. It shouldn't be necessary to consult the problem statement to figure out what problem is being solved. Yes, that means using words and learning to write/speak physics!

Don't expect to solve problems adequately in the last hour before class. Start early so you can ask questions in time to get help.

The presentation must be organized. You will find it necessary to work problems out initially on scratch paper, then re-copy them so the presentation follows a logical flow easily understood by others, with the wrong turns and preliminary mistakes removed. Do not turn in a hastily written first attempt. Do not crowd several problems solutions onto one page. Do not erase large tracts of errant calculations and write over the used real estate. Big mistakes call for a new sheet of paper.

Include diagrams that illustrate the system under consideration. Visualizing the problem whenever possible is an essential habit. Identify important variables or parameters in the problem in your diagram, give them symbolic names if not specified in the problem, and list given or known values for these.

Start with equations representing basic principles, definitions, and properties. Work problems symbolically as far as possible. Plug in numbers after all the algebraic manipulations.

Use standard and correct notation. Vector quantities need arrows: $\vec{E}$ or $\vec{B}$. Write *complete* equations: equations have expressions on both sides of an equals sign. Work *down* the page, presenting one step of a calculation at a time. Don't present several steps in a horizontal sequence, or try to combine several algebraic manipulations into a single line. Neither $\rightarrow$ nor $\Rightarrow$ is a substitute for =. There's no shame in writing out a series of simple steps in detail to ensure you get the correct result. Hasty work is error-prone.

Include units with all numerical values throughout. Show explicitly that the units reduce to the final result as part of the step-by-step presentation. Do not add units at the end of a problem as an afterthought.

Display an appropriate number of significant figures (usually 3 or 4). Mindlessly copying a number from a calculator display with many digits when only three are appropriate is silly and a waste of time. Learn how to make your calculator display scientific notation with 3 or 4 significant figures only.

There will be standard deductions to homework scores for neglecting these basic expectations. Most of these expectations aren't difficult to meet. In fact, they are simple when they become routine habits.