Physics 1302W.100
Introductory Physics for Science and Engineering II
Spring 2013

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Course Goals and Objectives & Liberal Education Requirement

Welcome to Physics 1302W. This is the second semester of a three-semester introductory course in physics for students whose main interests are in the physical sciences or/and engineering. The Physics 1301/1302/1303 sequence is designed to prepare you for work in your chosen field by having a solid conceptual understanding of the way the real world works based on a few fundamental principles of physics; being able to solve realistic problems using logical reasoning and quantitative problem solving skills; applying those physics concepts and problem solving skills to new situations; and learning to effectively communicate technical information.

The class exposes the student to physical principles and concepts, demonstrates how these principles can be applied to quantitatively describe natural phenomena, and provides the student with an opportunity to perform hands-on experiments and measurements that model how physical knowledge is obtained. The fundamental principles of electricity and magnetism are explored and the application of these physics concepts in modern technology is emphasized. The development of conceptual understanding of physical principles and their quantitative application are further deepened in the discussion section, where students practice problem solving skills. In addition, familiarity with the methods and findings of the physical sciences not only forms a crucial component of a common education, but also prepares students to be scientifically literate citizens.

Because all knowledge in the physical sciences is empirically acquired, the laboratory component of the course is essential to properly expose students to the scientific method and the ways of knowing and thinking in the physical sciences. The lab component involves the formulation of scientifically sound predictions by the student, followed by empirical testing of the hypotheses through hands-on experimentation. Since the language of the physical world is mathematical, quantitative analysis of experimental data is an essential aspect of the lab experience. Physics, like all sciences, is a social endeavor, and students are exposed to cooperative problem solving, working in small groups with other students, in both the laboratory and discussion sections of the course.

Many rewarding careers involve electromagnetic research and applications and a thorough understanding of and proficiency in electromagnetism as introduced in Physics 1302W is an excellent first step towards one of those careers, in addition to being part of a sound foundation in a student’s understanding of the physical world.
Class Dates, Times and Locations

Lectures: M, Tu, and W from 8:00AM-8:50AM in Physics 150

Laboratory and Discussion Sessions: Details can be found at http://tinyurl.com/aw3wem2

Discussion session group quizzes: Feb. 14, Mar. 7, Apr. 4, and Apr. 25
In-lecture quizzes: Feb. 15, Mar. 8, Apr. 5, and Apr. 26 (lectures will not be held on Fridays, but all four in-lecture quizzes will be)

Final Exam: Thursday, May 16 from 6:30PM-9:30PM. Location to be announced.

Class Web Page

To access the class web page, go to http://www.physics.umn.edu/courses/ and select 1302W.100. You must log in using your University X.500 username and password. The Postings section of the class web page will be the location for announcements regarding lectures, laboratory, homework, quizzes, and the final exam. The laboratory schedule and solutions to the homework and quizzes will also be posted in the Postings section. You can download, as a .pdf file, any material appearing on the class web page, including this syllabus. It is extremely important for you to regularly check the class web page over the course of the semester. Correspondingly, it is extremely important for you to learn how to navigate the class web page and download .pdf files from it.

Office Hours

Mondays, 11:15AM-12:05PM in Physics 163
Tuesdays, 1:25PM-2:15PM in Physics 163
Other times by appointment

Email and Phone Policy

Generally, email or phone does not work as a means of communication with the professor for a class of this size. Therefore, I will not reply to any email or voice mail except in certain cases. Please come by in person, during office hours, or after class and I will be more than happy to help you out as best I can.

Tutorial Room (137 Physics)

Beginning January 28, TAs will be available every weekday to answer your physics-related questions. The TA tutoring schedule will be posted outside room 137.
Required Texts

The textbook used for this class is Paul A. Tipler and Gene Mosca: Physics for Scientists and Engineers, 6th edition, Volume 2.

We will be using WebAssign (i.e., weekly graded online homework assignments) this semester.

If you purchase the class textbook at the University Bookstore, it should come “bundled” with a WebAssign access card.

Another option is to go directly to WebAssign (http://www.webassign.net/) to purchase WebAssign access, the cost of which includes access to the electronic version of the class textbook. An extra 25-30 dollars will get you a hard copy of the class textbook. The WebAssign “class key” is umn 6721 9109.

A .pdf copy of the 1302W laboratory manual can be found at the “Postings” link on the class web page.

A laboratory journal (U of MN 2077-S) is required for laboratory. If there is space available, the journal used for 1301W is acceptable. New ones can be purchased at the University Bookstore.

An inexpensive scientific calculator with exponentials, trig functions, etc. is also required.

We will not be using “clickers” in Physics 1302W.100.

Supplementary Texts

Calculus will be used extensively in this course. If it is a few years since you have taken a calculus course, it would be a good idea to use your old calculus textbook to review basic differential and integral calculus. Several books have been written that offer help in the calculus topics relevant to introductory physics, for example, Calculus Made Easy, by Thompson and Gardner, published by St. Martin’s Press, How to Ace Calculus, by Adams, Thompson, and Hass, published by Freeman and Company, The Competent Problem Solver for Introductory Physics: Calculus Version, University of Minnesota, School of Physics and Astronomy, Mathematical Preparation for General Physics with Calculus, by Davidson and Marion, published by W.B. Saunders Company, and So You Want to Take Physics, by Cole, published by Saunders College Publishing.

The Class

While brisk and challenging, the pace of this course nonetheless allows you to understand the material in depth, even if you have not previously studied this subject. The course is structured so that each topic builds on those covered previously. Therefore it is important that you understand each topic as it is presented. If something is unclear, don't ignore it in the hope that it won't be covered on the test. The topic that you don't understand now may turn out to be essential for the understanding of tomorrow's topic, which may in turn be essential for the
understanding of next week's topic, etc. There are many sources of help: come to me after lecture, or during my office hours; ask your TA during discussion sessions or during office hours; ask your fellow students. Don't be passive. The difficulties won't clear up by themselves. It may require hard work to master some of the essential concepts of physics, but you cannot expect to have a successful career in science or engineering without a capacity for hard work. Expect a workload consistent with University policy (three effort hours per week per credit, for an average student to receive an average grade). This means at least 12 hours per week, which is at least six hours outside scheduled class meetings.

Class Prerequisites

This course assumes a physics background of Physics 1301W or its equivalent (i.e., calculus-based mechanics) and a mathematical background equivalent to high school calculus and its mathematical precursors (algebra, trigonometry, etc.).

Vectors will be used extensively in this course, so it is important that you very quickly become proficient in their use if you are not already.

Lecture

The lectures will follow the sequence of topics presented in the book. I will try to clarify issues that I think are possible sources of confusion, and to emphasize the essential physical concepts for each topic. Lecture demonstrations will show the applicability of the theory to real-life situations. You will get much more out of each lecture if you have already read the relevant material in the textbook. A tentative schedule is presented below, showing the topics to be covered in each lecture.

Homework Problems

Each week, approximately 8-16 practice problems will be assigned, the majority of these problems being solved for credit via the WebAssign system (details above):

http://www.webassign.net/

It is essential that you practice solving these problems while the associated lecture material is fresh in your mind. The number of problems you need to attempt will vary for each person and each topic but in general the more you do the easier they will be for you. It is strongly recommended that at a minimum you solve the assigned problems. The solutions to all of the end-of-chapter textbook problems will be posted on the class web page but a solution is only useful to you if you seriously attempt the problem before looking at the solution. Only look at a posted solution after you have arrived at your own solution or have become incurably stuck. It is highly recommended that you attempt to solve additional problems (as many as you have time for) from the textbook for more practice - it cannot be stressed enough how important working as many practice problems as possible (and some fraction of those under test conditions) is to a student’s learning and performance on quizzes and the final exam. Another good strategy is to form learning groups that allow you to discuss the problems and gain better insight this way.
**Discussion Sessions**

During the discussion session you will work in TA-assigned teams of 3-4 students to solve physics problems for practice as well as for a grade (discussion session quizzes). A discussion session group will work practice problems together for several weeks prior to a discussion session quiz. After a discussion session quiz, your TA will put you into new groups. Given the group nature of discussion session practice problems and quizzes, students missing practice discussion sessions without a University-recognized excuse (see below) will be penalized 25% of their group quiz score per missed practice discussion session. For example, a student misses two practices, but takes the associated group quiz and his group scores a “100”. That student ends up getting a “50” \(100 - 2 \times 0.25 \times 100\) on that group quiz. *Note that coming more than 15 minutes late to or not actively participating in a practice discussion session is equivalent to missing that discussion session.*

**Laboratory Sessions**

Because this course satisfies University requirements as a laboratory science class and as a writing intensive course, you must pass the laboratory (with a score of 60% or greater) to receive a passing grade in the course. The laboratory grade will be based on well-thought-out predictions, collaborative skills as evidenced by effective group work (laboratory and discussion session groups are identical), and well-organized and clearly written technical reports. You will write a total of *four* laboratory reports. The specific laboratory experiments on which you will write your four reports will be assigned to you by your TA according to the following schedule:

Laboratory Report #1: Assigned the week of 2/18-2/22; due the week of 2/25-3/1.

Laboratory Report #1 Re-write: Due the week of 3/11-3/15

Laboratory Report #2: Assigned the week of 3/25-3/29; due the week of 4/8-4/12.

Laboratory Report #3: Assigned the week of 4/8-4/12; due the week of 4/15-4/19.

Laboratory Report #4: Assigned the week of 4/29-5/3; due 5/6-5/10.

*Your TA will provide you with the required laboratory report format and associated grading scale. 80% of a given laboratory report score will be for the lab report itself and the remaining 20% will be a function of a given student’s pre-lab work (please see below).*

A good laboratory report clearly and succinctly describes what you did in laboratory and why, how you did it, what your results were (typically in the form of appropriately labeled tables and graphs), the meaning of those results and how they confirmed or disproved what you believed prior to the experiment, and the “goodness” of those results (i.e., the accuracy and precision of results and sources of experimental error).

Reports must be given to your laboratory instructor for grading no more than one week after they are assigned. Late reports will result in a penalty of 20% deducted per day late (e.g., a “100” lab
report turned in 5 days late will be marked down to a “0”). Graded reports will be returned to you no later than your next laboratory meeting. During the course of the semester, you will be allowed to resubmit one (and only one) report (the first assigned or completed lab report), to achieve a higher grade. It must be given to your laboratory instructor within one week of the time the original report was returned to you. Laboratory data is taken cooperatively, but you are responsible for writing your own reports. Copying laboratory reports can result in a failing grade for the course and expulsion from the University.

Your laboratory grade will be the fraction of the points you earn on the four laboratory reports. Failure to earn at least 60% of the possible points on those four laboratory reports will result in an “F” course grade, independent of performance in other areas of the course.

At the end of the semester I will compare laboratory section grade averages and adjust certain sections’ grades upwards (and only upwards) if significant grade disparities across sections exist.

Read the relevant portions of the laboratory manual before attending a laboratory session. Each laboratory experiment has several components. Your TA will tell you which components to prepare for each week. All of the laboratory experiments (or “problems”, as they are called in the laboratory manual) have sections titled "Prediction" and "Warm-Up". Per your TA’s specific instructions, give your TA your predictions and answers to the "Warm-Up" questions prior to your scheduled lab session. Missing one laboratory session without a University-recognized excuse will result in a 25% deduction from the grade of the laboratory report (50% if you miss 2 laboratory sessions, etc.) assigned subsequent to the missed laboratory session. Typically, laboratory session make-ups are not allowed, even in the event of a University-recognized absence, but in certain cases students may be allowed to attend another section’s laboratory session to conduct an experiment they have missed.

**Quizzes and Final Exam**

Your final grade will be based, in large part, on your quiz and final exam scores. There will be no make-up quizzes. If, for some reason, you are unable to take an in-lecture quiz at the scheduled time, the resulting “0” quiz score shall be dropped in the final computation of your score as described in the “Grading” section below. Likewise in regards to your absence-affected discussion session quiz aggregate score. Only under extraordinary, University-recognized circumstances will a student be allowed to make up the final exam (see “Physics Department Policy on Incompletes” section below).

**Absence from Lecture, Lab, Discussion Session, Quizzes**

If you need to stay home because of illness, or for any other reason, please inform your TA for the lab and discussion sessions. The TAs will be keeping meticulous attendance records. It is important to notify them as soon as possible, at least three hours before that section starts or by 7 am, whichever is later, but not weeks after the session. There is no need to notify me.

There is no need to inform me or the TAs about missed lectures or quizzes.
Given the attendance-dependent nature of discussion session group quiz scores and laboratory report scores as discussed above, students with unexcused laboratory and discussion session absences will see their grades suffer. The following link describes what the University of Minnesota considers to be an excused absence (a “University-recognized” excuse) along with associated verification procedures: [http://tinyurl.com/3qqgd2t](http://tinyurl.com/3qqgd2t).

**Grading**

The course grade will be determined by combining the grades from the various components of the course in the following way.

(a) Each of the four in-lecture quizzes will count as 10% (any in-lecture quiz scores lower than your final score will be dropped).

(b) The aggregate (score) of your four discussion session quiz scores will count as 10% (this aggregate score will be dropped if it is lower than your final score).

(c) The final will count as 25% of your grade if no quiz component (four in-lecture and one discussion session) is dropped, 35% if one quiz component is dropped, 45% if two are dropped, 55% if three are dropped, 65% if four are dropped, 75% if five are dropped.

(d) The laboratory will count as 20%.

(e) WebAssign homework problems will count for 5%.

All grades will be on a scale of 0-100%. The numerical score will be weighted in accordance with the unit distribution given above, again on a scale of 0-100%. The final letter grade for the course will then be assigned as follows:

- **A**: greater than or equal to 90%
- **B+**: less than 85% and greater than or equal to 80%
- **B**: less than 80% and greater than or equal to 75%
- **B-**: less than 75% and greater than or equal to 70%
- **C+**: less than 70% and greater than or equal to 65%
- **C**: less than 65% and greater than or equal to 60%
- **C-**: less than 60% and greater than or equal to 55%
- **D+**: less than 55% and greater than or equal to 50%
- **D**: less than 50% and greater than or equal to 45%
- **D-**: less than 45% or a laboratory grade less than 60%
- **F**: less than 45% or a laboratory grade less than 60%.

**Example of grade calculation:** Consider the set of grades: 86%, 59%, 74%, 90% (in-lecture quizzes); 85% (discussion quiz aggregate score); 83% (final), 87% (laboratory), and 90% (WebAssign homework). The in-lecture quizzes with scores of 59% and 74% will be dropped. The total numerical score is then \((86+90)(0.10) + (85)(0.10) + (83)(0.45) + (87)(0.20) + (90)(0.05) = 85\), yielding an A- grade. Suppose the scores for the final and the second in-lecture quiz were exchanged, so that the score on the final was lower than all quiz scores. Then the total numerical score would be \((86+83+74+90)(0.10) + (85)(0.10) + (59)(0.25) + (87)(0.20) + (90)(0.05) = 78\), yielding a B grade.
Resolving Grading Disputes

If you feel you have been graded unfairly or incorrectly and would like to contest your grade or score or would like to request a re-grade, you need to submit a written statement (on a separate sheet of paper – not on the graded paper) with detailed explanation why you should get a better grade or what is wrong with the grading. You need to submit your request for re-grade or contest of grade to me within one week after the grade/score has been returned to you. The only exception to this rule will be in regards to any revisions made to the first assigned or completed lab report – the details/requirements regarding that particular re-grade will be at the discretion of your TA.

Physics Department Policies

Athletes must provide their official University of Minnesota athletic letter containing the approved competition schedule to their instructor and the staff in office 148. Away exams will be arranged with the athletic adviser traveling with the team. Accommodations will be made for official university sports only (i.e. no accommodations will be made for intramurals, club sports, etc.)

Disability Services: If you have accommodations for this course, please provide the staff in office 148 with a copy of your accommodation letter for the current semester. Exams will be arranged according to accommodations and sent to the testing center for administration.

Incompletes: In order to receive an incomplete you must have completed all portions of the course satisfactorily, including the labs, up to the date of the incomplete. An incomplete requires extraordinary, University-recognized circumstances as an excuse for not completing the course on time. It requires a written and signed agreement between the professor and the student, which is placed on file with the Physics Department. You cannot retake a major portion of the course through an incomplete.

University of Minnesota Policies

- Student conduct code
  [http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.html](http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.html)

- Scholastic Dishonesty
  See student conduct code

- Disability Accommodations
  [http://ds.umn.edu/student-services.html](http://ds.umn.edu/student-services.html)

- Use of Personal Electronic Devices in the Classroom
  [http://policy.umn.edu/Policies/Education/Education/CLASSROOMPED.html](http://policy.umn.edu/Policies/Education/Education/CLASSROOMPED.html)

- Makeup Work for Legitimate Absences (addressed above)
Announcements

It is occasionally necessary to change schedules, including the dates of quizzes. Students are responsible for all announcements made during the lecture, discussion session or laboratory period. The most important announcements will be posted on the “Postings” section of the class web page. Missing an announcement is not an acceptable excuse for missing a quiz or a course-related deadline. It is the responsibility of any student missing a lecture to determine what course material and/or announcements were missed. **It is likewise the responsibility of every student to read and understand the contents of this syllabus.**

**Tentative Lecture Schedule**

Week 1   (1/21)  Chapter 21: Electric Forces & Fields: Discrete Charge Distributions  
Week 2   (1/28)  Chapter 21: Electric Forces & Fields: Discrete Charge Distributions  
Week 3   (2/4)    Chapter 22: Electric Forces & Fields: Continuous Charge Distributions  
Week 4   (2/11)  Chapter 22: Electric Forces & Fields: Continuous Charge Distributions;  
Chapter 11: Gravity  
Week 5   (2/18)  Chapters 11: Gravity; Chapter 23: Electric Potential  
Week 6   (2/25)  Chapter 23: Electric Potential  
Week 7   (3/4)    Chapter 24: Capacitance  
Week 8   (3/11)  Chapter 24: Capacitance; Chapter 25: Electric Current and DC Circuits  
Week 9   (3/18)  Spring Break  
Week 10 (3/25)  Chapter 25: Electric Current and DC Circuits; Chapter 26: The Magnetic Field  
Week 11 (4/1)   Chapter 26: The Magnetic Field  
Week 12 (4/8)   Chapter 27: Sources of the Magnetic Field  
Week 13 (4/15)  Chapter 27: Sources of the Magnetic Field; Chapter 28: Magnetic Induction  
Week 14 (4/22)  Chapter 28: Magnetic Induction; Chapter 29: AC Circuits  
Week 15 (4/29)  Chapter 29: AC Circuits  
Week 16 (5/6)   Chapter 30: Maxwell’s Equations and Electromagnetic Waves