Physics 1302W.600 (4 credits) Spring 2016
Introductory Physics for Science and Engineering II

1 General Information

Welcome to Physics 1302W. This is the second semester of a two-semester introductory course in physics for students whose main interests are in the physical sciences and engineering. This semester is devoted to the study of electromagnetism and its many applications. The science of electromagnetism was formulated primarily during the 18th and 19th centuries by such luminaries as Gauss, Faraday, and Maxwell. The concepts they developed describe a wide variety of physical phenomena and underlie many of today’s technologies. The material you learn in this course will be important to you throughout your working life in any science-related career. It will also help you to understand the physical world around you. In this course you will: (i) develop a solid understanding of how the real world works based on a very small number of fundamental principles of physics; (ii) learn to solve complex problems by applying the fundamental principles of physics both qualitatively and quantitatively; (iii) be able to decide on the applicability of principles and techniques; and (iv) learn how to communicate technical information in an organized and intelligible manner.

Instructor: Aaron Wynveen
Office: Shepherd Labs 397
Phone: 612-625-6967 (not ideal for communication)
E-mail: wynveen@physics.umn.edu, but not a good idea with this many students. If you have a question, see me in person after class or during my office hours.
Office hours: 4:40-5:30, Mondays and Wednesdays, 250 Blegen Hall.
Tutorial room (140 Williamson): Starting from January 25, Teaching Assistants will be available at certain times during the week to answer your physics-related problems. Times will be posted outside room 140. Note, ALL TAs should be able to help.

2 Required Materials

The textbook used for this class is Eric Mazur, *Principles & Practice of Physics*, volume 2. (Note, each volume consists of two books: *Principles*, which is the main text, and *Practices*, which provides a review, and worked/homework problems.) When you buy the book from the bookstore, access is provided to the MasteringPhysics website, over which you will complete your homework and have access to other materials, including an e-book of the text (I believe).
To sign up to MasteringPhysics:
(1) Go to http://www.pearsonmylabandmastering.com/northamerica/masteringphysics
(2) Choose “Student” and correct location, “In US or Canada”.
(3) Choose “Yes, I have a course ID”, filling in MPWYNVEEN1302SP2016. Note, you must use this ID to register for our particular lecture section.
(4) Choose “Yes, I have an access code”. Note, if you do not have an access code, you will have to purchase access to MasteringPhysics and the e-book online or from the book store.
(5) Fill in the access code and choose, as your login name, your U of M X.500 ID, e.g., wynv0001 (unless you already have an account with Pearson.)

Hopefully, you will now have an account with Pearson in order to access MasteringPhysics, which includes the homework assignments as well as the e-book.

The laboratory manual will be available free(!) via the course website. You should download from the course website the lab problems when they appear, generally, a week before a particular lab takes place. You will also need a graph-ruled lab journal (e.g., a U of MN 2077S notebook). Note, we will not be using remote “clickers” in our specific lecture section. Finally, a cheap, scientific calculator is required. Please do not use graphing calculators.

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 re-read the introductory parts of your old calculus textbook. Several books have been written that offer help in the calculus topics relevant to introductory physics, for example: 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.

### 3 Class Times, Locations, and Important Dates

- **Group Quizzes (tentatively):** 2.8, 2.29, 3.28, 4.18 (Mondays in the Discussion Sessions)
- **In-lecture Quizzes (tentatively):** 2.10, 3.2, 3.30, and 4.20 (Wednesdays, 5:45-6:35, Location TBD)
- **Final Exam:** Thursday, May 12, 6:30-9:30 pm. Location TBD
- **Lectures:** M,W 5:45-7:25 in Willey 125. (Note, formal lectures will often end earlier, followed by Q&A sessions.)

<table>
<thead>
<tr>
<th>Dis./Lab Sec.</th>
<th>TA</th>
<th>Disc. Time (pm), Loc.</th>
<th>Lab Time, Wlmsn 150-</th>
</tr>
</thead>
<tbody>
<tr>
<td>601/602</td>
<td>Mengxing Ye</td>
<td>M 7:40, AmundH 104</td>
<td>Tu 2:30-4:25, A</td>
</tr>
<tr>
<td>603/604</td>
<td>Sajna Hameed</td>
<td>M 7:40, FordH 170</td>
<td>Tu 2:30-4:25, B</td>
</tr>
<tr>
<td>605/606</td>
<td>Jianlong Fu</td>
<td>M 7:40, SmithH 111</td>
<td>Tu 4:40-6:35, A</td>
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<tr>
<td>607/608</td>
<td>Benjamin Smidt</td>
<td>M 7:40, SmithH 121</td>
<td>Tu 4:40-6:35, B</td>
</tr>
<tr>
<td>611/612</td>
<td>Kate Ciampa</td>
<td>M 7:40, BruinH 420A</td>
<td>F 2:30-4:25, A</td>
</tr>
<tr>
<td>613/614</td>
<td>Andrew Reid</td>
<td>M 7:40, BruinH 119</td>
<td>Th 12:20-2:15, G</td>
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<tr>
<td>620/621</td>
<td>Mengxing Ye</td>
<td>M 8:45, SmithH 121</td>
<td>Tu 6:50-8:45, A</td>
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<tr>
<td>622/623</td>
<td>Benjamin Smidt</td>
<td>M 8:45, SmithH 111</td>
<td>Tu 6:50-8:45, B</td>
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<tr>
<td>624/625</td>
<td>Jianlong Fu</td>
<td>M 8:45, AmundH 156</td>
<td>W 2:30-4:25, A</td>
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<tr>
<td>626/627</td>
<td>Kate Ciampa</td>
<td>M 8:45, AmundH 104</td>
<td>W 2:30-4:25, B</td>
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<tr>
<td>630/631</td>
<td>Sajna Hameed</td>
<td>M 8:45, BruinH 420A</td>
<td>F 2:30-4:25, B</td>
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</table>
4 Class Web Page

URL: https://www.physics.umn.edu/courses and select 1302W.600. You must log on using your University X.500 user name and password. The class web page will be the location for announcements regarding lectures, lab, homework, quizzes, and the final exam. Solutions to the homework and quizzes will be posted here. You can download, as a .pdf file, any material appearing on the class web page, including this Syllabus.

5 The Class

While brisk and challenging, the pace of this course should allow 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, do not ignore it in the hope that “It won’t be covered on the test”. The topic that you do not 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; work with your classmates. Don’t be passive. The difficulties will not clear up by themselves. It may require hard work to master some of the essential concepts of physics, but with enough practice, you will come to understand (and appreciate) even the most difficult concepts.

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. Example problems will also be done during class to show you how to approach a problem. You will get far more out of each lecture if you have already read the relevant material in the textbook. A tentative schedule is presented below, showing the chapters to be covered each week.

Clicker: Nearly every class period, a clicker question will be asked. For our lecture section, we will use “analog” clickers, and so the clicker questions will not be formally graded and, hence, will not contribute to your course grade. Color-coded “answering cards” will be provided during the first lecture session and should be brought to every lecture. Please write the numbers (large, in black magic marker) on the corresponding cards: blue = 1; pink = 2, green = 3, violet/orange = 4, yellow = 5.

Homework: Every week or two, approximately 20-30 problems will be assigned via the MasteringPhysics website; however, only (roughly) 10 will count toward your homework grade. These should be completed by the due date provided with the assignment. (No credit is awarded if submitted after the due date.) The additional problems that are not worth points have been assigned strictly to provide more practice. Since physics is a subject that is learned by doing, the more practice problems worked out [and there are plenty of problems to prac-
tice: examples in the main text and Review Questions, Guided Problems, and odd Questions and Problems (which have answers in the back) in the Practices text, the better you will understand how to apply physical concepts to new problems and, likely, the better you will perform on the examinations. While you are working on the homework problems, you are encouraged to discuss them with your fellow students and to seek help from all sources, such as utilizing the TA office hours in Wmsn 140. However, the MasteringPhysics problems submitted for grading should be done by you alone.

Discussion Sessions: During the Discussion Session you will solve physics problems, working together in teams of 3-4 students. After the problem has been solved, students may be called to the board to discuss their answers. On those weeks when the In-lecture Quiz is held, the Discussion Session will be devoted to the “Group” portion of the quiz. Active participation in the Discussion Sessions is required for taking the Group Quizzes. Missing a discussion session without a valid excuse will result in a 5-point deduction from the subsequent group portion of the quiz.

Quizzes and Final Examination: Your course grade will be based, in part, on your quiz scores (four Discussion Session/In-lecture Quizzes). Each quiz score has a “Group” component, worth 25% of your total quiz grade and which is administered in the Thursday Discussion Session and an In-lecture component, which is worth the remaining 75% of your total score. The lowest quiz score will be dropped, so that only three of your quiz scores will be used in determining your course grade. If, for some reason, you are unable to take a quiz at the scheduled time, this missed quiz will act as your dropped quiz. If you must be away from campus at the time of the final exam, I will try to arrange for you to take the final at some other time. For the quizzes, you may prepare and use one 8.5” by 11” (double-sided) hand-written sheet of equations. Please hold on to these crib sheets since they may be useful later.

6 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, and well-organized and clearly written technical reports.

You will write a total of four laboratory reports. The specific part of the laboratory for which you will write a report will be assigned to you by your instructor at the end of each laboratory topic (about every two-three weeks). Reports should be about 4 typed pages, including all necessary predictions, graphs, data tables, and calculations. Reports must be given to your laboratory instructor for grading no more than one week after they are assigned. Late reports will not be accepted. Graded reports will be returned to you no later than your next laboratory meeting. You will be allowed to resubmit the first 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.

Lab data is taken cooperatively, but you are responsible for writing your own reports. Copying lab reports can result in a failing grade for the course. Details of the laboratory grading scheme are in your laboratory manual and will be explained by your TA.

Read the relevant portions of the lab manual before attending lab. Each lab has several components. Your TA will tell you which components to prepare each week. All the laboratory problems have sections called “Prediction” and “Warm-Up”. Give your TA the predictions and the answers to the “Warm-Up” questions two days before your scheduled lab session.

Failure to participate in one laboratory will result in -20% of the grade of the following lab report (-40% if you miss 2 labs, etc.). Since the laboratory involves teamwork, no laboratory makeup will be allowed except in situations officially recognized by the University. In that case, the laboratory work must be made up by arrangement with your TA before your next scheduled laboratory period.

7 Grading

Your course grade will be based on the following components:

Homework: 10%
Laboratory: 15%
Scores of the three best quizzes: 45% (= 3 × 15%)
Final Exam: 30%

Upon calculating your final numerical grade, you will receive a letter grade of:

A: ≥ 90%  A- : < 90% or ≥ 85%
B+: < 85% or ≥ 80%  B: < 80% or ≥ 75%
B-: < 75% or ≥ 70%
C+: < 70% or ≥ 65%  C: < 65% or ≥ 60%
C-: < 60% or ≥ 55%
D+: < 55% or ≥ 50%  D: < 50% or ≥ 45%
D-: < 45% or Lab grade < 60%

Resolving grading disputes: If you are dissatisfied with a grade you have received for any component of the course, express your complaint in a well-written paragraph on a separate sheet and give it to me along with the relevant papers. (Do NOT write on your exam.) I will consider the issue and give you the result as soon as possible.

Individual quiz scores may be rescaled (“curved”) at the end of the semester if deemed appropriate. You will be notified if this is the case.

8 Legal Matters

Policy on Cheating, from the CSE student guide: “The College of Science and Engineering expects the highest standards of honesty and integrity in the academic performance of its students. Any act of scholastic dishonesty is regarded as a serious offense, which may result in expulsion. The College of Science and Engineering defines scholastic dishonesty as sub-
mission of false records of academic achievement; cheating on assignments or examinations; plagiarizing; altering, forging, or misusing an academic record; taking, acquiring, or using test materials without faculty permission; acting alone or in cooperation with another to obtain dishonestly grades, honors, awards, or professional endorsement. Aiding and abetting an act of scholastic dishonesty is also considered a serious offense.” In cases of scholastic dishonesty, it is up to the instructor to determine the penalty.

8.1 Departmental Policies

Physics Department policy on 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 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.”

ATHLETES must provide their official University of Minnesota athletic letter containing the approved competition schedule to their instructor and the staff in Williamson 145. 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 Williamson 145 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.

8.2 Mandatory Policy Information

- Student conduct code
  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

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

- Makeup Work for Legitimate Absences
  http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html
8.3 Liberal Education Core Requirement

This class satisfies the University of Minnesota Liberal Education requirement of a physical science course with a laboratory component, as part of the Liberal Education Core. Discoveries and inventions that have profoundly altered the course of human history arose from the physical sciences. As citizens and voters (whether in the United States or in another country), today's students will be called upon to make decisions on such topics as global climate change, alternative energy sources and resource management. A familiarity with the methods and findings of the physical sciences has never been more important and forms a crucial component of a common education.

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.
9 Announcements

It is occasionally necessary to modify the course schedule, including the dates of quizzes. Students are responsible for ALL announcements made during the lecture, Discussion Session or Laboratory Period. Every announcement will be posted on the “Class News” 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.

10 Tentative Lecture/Laboratory Schedule

<table>
<thead>
<tr>
<th>Week (date)</th>
<th>Lecture topics</th>
<th>Lab Problems</th>
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<tbody>
<tr>
<td>Week 1 (1.19)</td>
<td>Chap. 22</td>
<td>BEMA</td>
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<tr>
<td>Week 2 (1.25)</td>
<td>Chap. 23</td>
<td>Labs I.1,2</td>
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<tr>
<td>Week 3 (2.1)</td>
<td>Chap. 24</td>
<td>Labs I.3,4,5</td>
</tr>
<tr>
<td>Week 4 (2.8)</td>
<td>Chap. 25 (Quiz #1: 22-24)</td>
<td>Lab review (Assign report)</td>
</tr>
<tr>
<td>Week 5 (2.15)</td>
<td>Chaps. 25 &amp; 26</td>
<td>Labs II.1,2,3,4</td>
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<tr>
<td>Week 6 (2.22)</td>
<td>Chap. 26</td>
<td>Lab III.1</td>
</tr>
<tr>
<td>Week 7 (2.29)</td>
<td>Chap. 31 (Quiz #2: 25,26)</td>
<td>Labs III.2,3,4 (Assign report)</td>
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<tr>
<td>Week 8 (3.7)</td>
<td>Chap. 31</td>
<td>Labs IV.1,2,3,8</td>
</tr>
<tr>
<td>March 14-18</td>
<td>Spring Break!</td>
<td>No Lab</td>
</tr>
<tr>
<td>Week 9 (3.21)</td>
<td>Chap. 27</td>
<td>Labs IV.9,10</td>
</tr>
<tr>
<td>Week 10 (3.28)</td>
<td>Chap. 28 (Quiz #3: 31,27)</td>
<td>Labs IV.4,5,6,7 (Assign report)</td>
</tr>
<tr>
<td>Week 11 (4.4)</td>
<td>Chaps. 28 &amp; 29</td>
<td>Labs V.1,7,8</td>
</tr>
<tr>
<td>Week 12 (4.11)</td>
<td>Chap. 29</td>
<td>Labs V. 2,5,6</td>
</tr>
<tr>
<td>Week 13 (4.18)</td>
<td>Chap. 30 (Quiz #4: 28,29)</td>
<td>Labs VI.1,2,3,4 (Assign report)</td>
</tr>
<tr>
<td>Week 14 (4.25)</td>
<td>Chaps. 30 &amp; 32</td>
<td>Labs VI 5,6</td>
</tr>
<tr>
<td>Week 15 (5.2)</td>
<td>Chap. 32 and Review</td>
<td>BEMA</td>
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