Physics 1402V – Honors Physics II (Spring 2016)

Instructor: Marco Peloso
Office: WBOB 130/9
E-Mail: peloso@physics.umn.edu  E-mail should be used only for emergencies. For any other circumstance, please approach the instructor after lecture or come to office hours.

Instructor Office Hours: (from week 2)
17:30 –18:30 Tu @ Middlebrook 132
09:05 –09:55 W @ Room Blegen 425

Class Times and Place:
Lecture: M T W F 11:15–12:05 Anderson Hall 210
(F lectures not every week)
Quiz: Feb 12 (F), Mar 9 (W), Apr 15 (F), only 11:15–12:05 Room Anderson Hall 210
Final: May 13 (F) 13:30-16:30  Room TBA

For all exams you will be allowed to use one crib sheet, prepared by the instructor, as well as one non-programmable and non-graphing calculator.

Required Textbook (available at the bookstore):
Paul A. Tipler and Gene Mosca:
Physics for Scientists and Engineers, 6th edition
(see page 5 for list of Chapters)

Supplementary Textbooks:
Ayres & Mendelson (Schaum’s Outlines): Calculus
Morgan: Calculus Lite
Competent Problem Solver, univ. of MN (posted)
Concerning physics, we will strictly follow the required textbook. The supplementary textbooks are a good reference if you think you need to do some more work for the math, or for solving the problems (the choice is up to you).

Class Webpage (go to http://www.physics.umn.edu/classes/ and choose Phys 1402V.001):
Please visit the class webpage regularly for official announcements regarding lectures, lab, homework, quizzes, and the final exam. Solutions to the quizzes will be posted here after they are graded. You must log in using your University X.500 Username and password.

Open-Door Policy:
If any difficulties or problems arise in this course that interfere in any way with your learning or optimum performance, please contact the instructor or your Discussion Leader, or your TA. We will do our best to deal with problems promptly and effectively.
Discussion Sections and Laboratories:

<table>
<thead>
<tr>
<th>Sec.</th>
<th>Disc. time</th>
<th>Room</th>
<th>Disc. Leader</th>
<th>e-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1402.2</td>
<td>11:15–12:05 Th</td>
<td>Blegen H 430</td>
<td>Paul Haines</td>
<td><a href="mailto:haines@physics.umn.edu">haines@physics.umn.edu</a></td>
</tr>
<tr>
<td>1402.3</td>
<td>11:15–12:05 Th</td>
<td>Rapson H 45</td>
<td>Pamela Sherwood</td>
<td><a href="mailto:pvo@physics.umn.edu">pvo@physics.umn.edu</a></td>
</tr>
<tr>
<td>1402.4</td>
<td>11:15–12:05 Th</td>
<td>Peik H 28</td>
<td>Tigran Sedrakyan</td>
<td><a href="mailto:tigrans@physics.umn.edu">tigrans@physics.umn.edu</a></td>
</tr>
<tr>
<td>1402.5</td>
<td>12:20–13:10 Th</td>
<td>Blegen H 140</td>
<td>Paul Haines</td>
<td><a href="mailto:haines@physics.umn.edu">haines@physics.umn.edu</a></td>
</tr>
<tr>
<td>1402.6</td>
<td>12:20–13:10 Th</td>
<td>Civil Engineering 212</td>
<td>Pamela Sherwood</td>
<td><a href="mailto:pvo@physics.umn.edu">pvo@physics.umn.edu</a></td>
</tr>
<tr>
<td>1402.7</td>
<td>12:20–13:10 Th</td>
<td>Appleby H 319</td>
<td>Tigran Sedrakyan</td>
<td><a href="mailto:tigrans@physics.umn.edu">tigrans@physics.umn.edu</a></td>
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<tr>
<td>101</td>
<td>12:20–14:15 M</td>
<td>Shepherd 462</td>
<td>Scott Dossa</td>
<td><a href="mailto:doss0032@umn.edu">doss0032@umn.edu</a></td>
</tr>
<tr>
<td>102</td>
<td>14:30–16:25 T</td>
<td>Shepherd 462</td>
<td>Scott Dossa</td>
<td><a href="mailto:doss0032@umn.edu">doss0032@umn.edu</a></td>
</tr>
<tr>
<td>103</td>
<td>14:30–16:25 W</td>
<td>Shepherd 462</td>
<td>Paul Fredrichsen</td>
<td><a href="mailto:fried667@umn.edu">fried667@umn.edu</a></td>
</tr>
<tr>
<td>104</td>
<td>14:30–16:25 M</td>
<td>Shepherd 462</td>
<td>Daniel Shaffer</td>
<td><a href="mailto:shaff159@umn.edu">shaff159@umn.edu</a></td>
</tr>
<tr>
<td>105</td>
<td>08:00–09:55 T</td>
<td>Shepherd 462</td>
<td>Paul Fredrichsen</td>
<td><a href="mailto:fried667@umn.edu">fried667@umn.edu</a></td>
</tr>
<tr>
<td>106</td>
<td>12:20–14:15 W</td>
<td>Shepherd 462</td>
<td>Scott Dossa</td>
<td><a href="mailto:doss0032@umn.edu">doss0032@umn.edu</a></td>
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<tr>
<td>107</td>
<td>12:20–14:15 T</td>
<td>Shepherd 462</td>
<td>Daniel Shaffer</td>
<td><a href="mailto:shaff159@umn.edu">shaff159@umn.edu</a></td>
</tr>
<tr>
<td>108</td>
<td>14:30–16:25 Th</td>
<td>Shepherd 462</td>
<td>Daniel Shaffer</td>
<td><a href="mailto:shaff159@umn.edu">shaff159@umn.edu</a></td>
</tr>
<tr>
<td>111</td>
<td>16:40–18:35 M</td>
<td>Shepherd 462</td>
<td>Paul Fredrichsen</td>
<td><a href="mailto:fried667@umn.edu">fried667@umn.edu</a></td>
</tr>
</tbody>
</table>

**TA Office Hours**: (starting from week 2)

<table>
<thead>
<tr>
<th>Discussion Leader / TA</th>
<th>Office hours</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scott Dossa</td>
<td>19:00-19:50 M</td>
<td>McNamara 160</td>
</tr>
<tr>
<td>Paul Fredrichsen</td>
<td>15:40-16:30 F</td>
<td>Shepherd 462</td>
</tr>
<tr>
<td>Paul Haines</td>
<td>10:10-11:00 T</td>
<td>Shepherd 462</td>
</tr>
<tr>
<td>Tigran Sedrakyan</td>
<td>18:30-19:20 T</td>
<td>PAN 334*</td>
</tr>
<tr>
<td>Daniel Shaffer</td>
<td>14:35-15:25 W</td>
<td>PAN 120</td>
</tr>
<tr>
<td>Pamela Sherwood</td>
<td>16:40-17:30 W</td>
<td>Shepherd 462</td>
</tr>
</tbody>
</table>

* = You need to enter the building before 19:00

**Honors Tutors**: (starting from week 2)

Aaron Hamann (haman142@umn.edu) and Benjamin Henderson (hende630@umn.edu)
W, 19:00-21:00, at Middlebrook.

**The Class**:

This is the second semester of a two-semester introductory course in physics for science and engineering students. It covers electricity and magnetism (tentative list of weekly topics at page 5).

The reason that your major requires you to take this course is to prepare you for work in your chosen field by:

- Having a solid understanding of how the real world works based on a very small number of fundamental principles of physics
- Being able to solve complex problems by applying the fundamental principles of physics both qualitatively and quantitatively
- Being able to decide on the applicability of principles and techniques
- Communicating technical information in an organized and intelligible manner
The pace of this course should allow you to understand the material in depth, but it does move right along. Don’t fall behind! It is extremely difficult to catch up and the longer you leave it the harder it gets. You are strongly advised to actively participate from day one by thoroughly reading the textbook and the lab manual, by doing as many problems from the textbook as you can (think about the physics needed for those that you do not explicitly solve), and by making sure to get all your questions answered during office hours. We will require that you always use and communicate a logical and organized problem solving technique. What you get out of the course will depend on the productive effort and quality time you put into it; all the help you need is readily available!

**Laboratory:**
Because this course satisfies University requirements as a laboratory science class and as a writing intensive course, you must pass the laboratory (70% or more of the maximum possible points) to receive a passing grade in the course; note that your use of English and your grammar are important. The laboratory grade will be based on the demonstration of a well-organized and correctly-written technical communication of the physics concepts of this course in your laboratory journal and reports, well-thought-out predictions brought to class, and collaborative skills as evidenced by effective group work.

50% of the laboratory grade will be determined by laboratory reports (a total of 2). The remaining 50% will be determined by your lab journal (that will be inspected by your TA every week). Reports should be about 4 typed pages (use of a word processor is required and such facilities are supplied by the University) including all necessary predictions, graphs, data tables, and calculations. See page 5 or the dates in which reports are assigned and due. Late reports will not be accepted. After the first lab report is returned to you, you will be allowed to revise it, to achieve a higher grade. If you wish to do the revision, you need to hand it to your TA within the date specified at page 5. Only the first lab report can be revised. Details of the laboratory grading will be announced in lab.

Read the lab manual ahead of time, so to be familiar with the lab of that week. This will save considerable time, and will allow you and your team mates to use the time efficiently for that lab.

Participation in the lab is mandatory, and the penalty for not participating in a lab is a decrease of 25% of the grade of the more immediate future lab report, as well as a zero score in the lab journal of that week. This penalty is cumulative (if you miss two labs, the decrease will be 50%, and so on...) 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.

**In–class response:**
On average, you will be asked one multiple choice question per lecture, to be answered with the electronic response system. Answering will give one point. Answering correctly will give two points. In many cases, it will be a simple question on something which has just been explained on the same day. The student responder shall be acquired at the bookstore. To set up your clicker, register it online at the Moodle class web page http://ay15.moodle.umn.edu/course/view.php?id=13222

Instructions to register the clicker are posted there, and the registration is done using the box on the top left of the page.

Once in the classroom, in order to answer a question the clicker needs to be set to the appropriate channel for the class. The right channel is AB. To change channel, switch on the clicker, and then press and hold the power button. After a few seconds, the frequency number will appear on the
screen, and you will be able to change it. Press AB.
The answers are automatically recorded by the system. If you miss a class, or if you forget your
clicker, there is no way for the instructor to give you a score for that question.

The default option is that you are enrolled in the In–class response. If you want to opt out, please inform the instructor within the first two weeks of class.

**Thursday discussion section:**
The participation is mandatory. You will solve problems in groups. These problems are not graded, but keep into account that problem solving is an essential component of the class (both for the purpose of learning the material and of preparing for the quizzes).

**Quizzes:**
Three quizzes will be given on the dates specified at the beginning of this syllabus. These quizzes will usually consist of 2 problems together with five multiple choice questions. Each problem will count for 35% of the quiz score, and each multiple choice question will count for 6%. We hope to return quizzes during the discussion session the following week. Solutions will be posted on the class webpage. Although more focused on the latest topics, each quiz probes all the material from the beginning of the class to that week.

**Homework:**
Homework problems will be assigned each Thursday, and they will be due at the start of the Thursday class one week after they are assigned. Each homework consists of ~ 5 problems (this number will vary). Due to limited resources, we will not be able to grade all problems. One problem will be randomly selected per homework, and your grade in the homework will be based only on that problem (the same problem will be chosen for all students). Solutions of the homeworks will be posted online after the due date.

Besides homeworks, you are strongly encouraged to work on the problems from the textbook, as many as possible - solving problems is by far the best way to learn the material in this course.

**Grade:**
The course grade will be determined from the various components of the course in the following way:
(a) The homeworks will count for 10%.
(b) The laboratory will count for 15%.
(c) In–class response will count for 5%.
(d) Each quiz will count for 15% of the score.
(e) The total grade will then be determined as the maximum over the following 4 possibilities:

1. Three quizzes at 15% each and final at 25%.
2. Two quizzes at 15% each and final at 40%.
3. One quiz at 15% and final at 55%.
4. Zero quizzes and final at 70%.

We will automatically assign you the highest grade obtained from these possibilities. This grading scheme allows you to not count a quiz that you missed or a quiz on which you did not perform well toward your final grade (notice however that the final exam carries a weight in all the available options). The scheme also allows you not to take any quizzes and base your final grade heavily on the final exam. However, you are strongly encouraged to take the quizzes regularly, this is the best way to ensure your good progress in the class.
If you choose to opt out the In-class questions (see the above section of the syllabus), your grade will be determined by the other entries, in the same proportion (the grade in all other entries will be multiplied by 100/95).

The letter grade for the course will be assigned according to the following approximate scale: A, A− (83–100), B+, B, B− (68–82), C+, C, C− (50–67), D+, D, D− (40–49), F (below 40 or a lab grade below 70%). This scheme is only approximate, and the instructor will be able to determine the precise dividing lines only at the end of the semester, after all the grades are known. So, he cannot be more specific than this before the final has been graded.

**Tentative Schedule, Spring 2016:**
(the tentative schedule will be updated with the actual schedule as the semester progresses)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Ch.</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1/19–22)</td>
<td>Electric charge; Electric field $\vec{E}$</td>
<td>21</td>
<td>NO LAB</td>
</tr>
<tr>
<td>2 (1/25–29)</td>
<td>$\vec{E}$; Gauss’ law</td>
<td>22</td>
<td>1.2 Standing Waves of Sound</td>
</tr>
<tr>
<td>3 (2/01–05)</td>
<td>Gauss’ law; Electric potential</td>
<td>22/23</td>
<td>1.3 Interference of Visible Light</td>
</tr>
<tr>
<td>4 (2/08–12)</td>
<td>Electric potential</td>
<td>23</td>
<td>2.1 $\vec{E}$; 2.2 $\vec{E}$ of Dipole</td>
</tr>
<tr>
<td>5 (2/15–19)</td>
<td>Capacitance</td>
<td>24</td>
<td>2.3-4 Deflection of electrons in $\vec{E}$</td>
</tr>
<tr>
<td>6 (2/22–26)</td>
<td>Capacitance; Electric currents</td>
<td>25</td>
<td>3.2 Measurements of Capacitance</td>
</tr>
<tr>
<td>7 (2/29–3/04)</td>
<td>Electric currents</td>
<td>25</td>
<td>Review</td>
</tr>
<tr>
<td>8 (3/07–11)</td>
<td>Magnetic field $\vec{B}$; and its sources</td>
<td>26/27</td>
<td>3.1 and 3.3 RC Circuits</td>
</tr>
<tr>
<td>9 (3/14–18)</td>
<td>Spring break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 (3/21–25)</td>
<td>$\vec{B}$; magnetism in matter</td>
<td>27</td>
<td>4.1-3 $\vec{B}$ of coils; magnetic force</td>
</tr>
<tr>
<td>11 (3/28–4/1)</td>
<td>Induction</td>
<td>28</td>
<td>4.4-5 Hysteresis; torque on $\vec{m}_B$</td>
</tr>
<tr>
<td>12 (4/04–8)</td>
<td>Inductance</td>
<td>28</td>
<td>5.1 Magnetic induction</td>
</tr>
<tr>
<td>13 (4/11–15)</td>
<td>AC Currents</td>
<td>29</td>
<td>5.2-3 Generator; $B(t)$</td>
</tr>
<tr>
<td>14 (4/18–22)</td>
<td>Maxwell equations</td>
<td>30</td>
<td>6.1 RLC Circuits; Resonance</td>
</tr>
<tr>
<td>15 (4/25–29)</td>
<td>Special relativity; electromagnetism</td>
<td>6.2 Construction AM radio</td>
<td></td>
</tr>
<tr>
<td>16 (5/02–06)</td>
<td>Special relativity; review</td>
<td>No lab</td>
<td>LD</td>
</tr>
</tbody>
</table>

F = Lecture on Friday (The F lecture schedule is tentative, and some F lectures will be added / removed; any changes will be announced in class);
LA = Lab report assigned;
LD = Lab report due;
Q = Quiz;
RD = Rewrite of lab report due
**Liberal 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 basic principles of classical mechanics and conservation principles are described with particular emphasis to their application in current technology, using mathematical analysis at the level of basic calculus. 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.

**Departamental 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.

**Student Conduct Code:**
The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see: [http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf).

Note that the conduct code specifically addresses disruptive classroom conduct, which means “engaging in behavior that substantially or repeatedly interrupts either the instructor’s ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities.”

**Scholastic Dishonesty:**
You are expected to do your own academic work and cite sources as necessary. Failing to do so is
scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, he or she may be given an “F” or an “N” for the course, and may face additional sanctions from the University. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: http://www1.umn.edu/oscai/integrity/student/index.html. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

Disability Accommodations:
The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.
If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations.
If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.
For more information, please see the DS website, https://diversity.umn.edu/disability/.

Use of Personal Electronic Devices in the Classroom:
Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

Makeup Work for Legitimate Absences:
Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html.

Appropriate Student Use of Class Notes and Course Materials:
Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines
instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

Grading and Transcripts:
Please see http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html.

Sexual Harassment:
“Sexual harassment” means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual’s work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: http://regents.umn.edu/sites/regents.umn.edu/files/policies/SexHarassment.pdf.

Equity, Diversity, Equal Opportunity, and Affirmative Action:
The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf.

Mental Health and Stress Management:
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: http://www.mentalhealth.umn.edu.