COURSE INFORMATION

Physics 1502V, Honors Introduction to Electricity and Magnetism, 4 Credits
Course Prerequisites: Completion of PHYS1501V, Honors, Permission of UHP. Knowledge of vector calculus is assumed.

Instructor: Paul Crowell
Office: PAN 220
Phone: 4-4828
Email: crowell@umn.edu (Email is not recommended as a means to contact me about routine class matters. Please take full advantage of the opportunity to talk to me before or after lectures as well as during my scheduled office hours.)
Office hours: To be determined

Instructor (Discussion sections and substitute lecturer): Ben Bayman
Office: McNamara 160/150
Phone: 4-0309
Email: bayman@physics.umn.edu (see note above about Email)
Office hours: TBD (to be held in PAN – 3rd floor study lounge)

Grader (Homework and Quizzes): Dmitrii Torbunov
Email: torbu001@umn.edu

Course Web Page:

http://www.physics.umn.edu/classes/phys/2016/spring/Phys%201502V.001/index.html

Course announcements and assignments will be posted on this page. You are also responsible for any announcements or assignments made on the web page, in class, or by email. The course email list will be based on the official list generated by the university. Please do not ask us to change to any other email address.

Lectures: MTWF 11:15 in Humphrey Center 184. Note that the March 9 quiz is scheduled on a Wednesday, and the other two quizzes are on Fridays. Most other Fridays will be used for lectures.

Discussion and laboratory sections as assigned: Discussion sections will meet on Thursday, January 21 and each week thereafter in STSS (now known as Bruiniks Hall) 123. Note that attendance at discussion sections is mandatory. Laboratories will meet (in Sheperd Lab 462) for the first time the week of January 25th.
*Classroom information can be found in the class schedule through OneStop.

REQUIRED MATERIALS

The following materials are required:

2. **Secondary Text:** Tipler and Mosca, *Physics for Scientists and Engineers, 6th edition*, Vol. 2. Any used copy of any version is fine, provided that it is the 6th edition and includes Chapters 21-33. We will not be using any of the electronic resources associated with this textbook.

3. **Lab Manual:** There is a PDF version posted on the website (the 1402 manual). You should download and print it out yourself, and you must bring it to lab each week. Do not rely on finding the manual online during the lab, because the lab computers will be in use. If you use a tablet or laptop, make sure it is fully charged before coming to lab.

4. **Laboratory logbook** as described below.

**EXAMS, LABORATORY, AND HOMEWORK**

**QUIZZES** - One-hour problem solving quizzes will be held **Friday February 12, Wednesday March 9, and Friday, April 15**, in this classroom. Grades earned on these quizzes will be credited towards your final course grade. Quizzes will be closed-book. The use of calculators (but not computers) will be allowed. NO MAKE-UP QUIZZES WILL BE GIVEN. Exceptions to this policy, in accordance with University-wide rules, will be considered only for those cases specified by policy:

[http://www.policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html](http://www.policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html)

Note that for the special cases covered by this policy, particularly intercollegiate athletic events and religious observances, you must advise me well in advance (in person and by confirming email) so that appropriate arrangements can be made. Note that illness is generally not a consideration in making exceptions to the exam policy unless a physician explains in writing that you were physically unable to take the exam.

**FINAL EXAM** - The result of a three-hour final exam will be credited toward your course grade. This exam will be held on **Friday, May 13, 13:30 – 16:30** at a place to be determined. The final exam will be closed-book and must be taken at the specified time and place. Exceptions to this rule will be granted only according to the university policies noted above.

**LABORATORY:** Laboratories will meet for the first time during the week of January 26th at the assigned time in Sheperd 462. The laboratory part of this course consists of six units: waves, electrostatics, capacitors and RC circuits, magnetostatics, Faraday’s Law, and RLC circuits. You will design and carry out experiments that address the fundamental principles being taught in the lecture part of the class. Your lab grade will be based on a lab logbook documenting your activities as well as two papers to be submitted over the course of the semester. Details, including due dates, will be provided at your first laboratory meeting. **Note that you must complete all six laboratory units, as well as both papers, in order to**
receive a passing grade in this course. Your lab logbook should be a bound quadrille-ruled (graph paper) notebook and should be used only for this course.

HOMEWORK: Each week on Friday a number of problems will be posted on the course website. Among these, some will be selected for grading and will be due at the beginning of discussion section the following week.

There is nothing more important to success in this course than mastery of the material as evidenced by problem solving. Do all of the problems assigned each week and then some more. Although you must submit your own answers to graded problems, discussion of homework problems with your peers is encouraged.

Some of the more difficult homework problems will be assigned as group exercises.

Remarks on grading - Problems on quizzes and the final exam will be graded based on your success in communicating a logical and organized path towards their correct solution, grounded in a correct assessment of the underlying physics. Diagrams, written explanations and especially a logical algebraic development done neatly and including well-defined variables and a consistent notation are key elements of the correct solution of problems. Disconnected diagrams, equations or answers simply written down without explanation will not receive credit. Partial credit will be given for steps of an organized solution up to the point where a departure from the correct solution path occurs, but only if these steps can be clearly understood by looking at the paper you submitted. Again: a grader looking at your paper must be able to understand what you have done, how and why you did it, and to discern the correctness of your reasoning.

ACADEMIC CONDUCT

Students in this course must adhere to all policies of the University of Minnesota and the College of Science and Engineering with respect to scholarship and conduct. These policies are available for review at:

http://regents.umn.edu/policies/index/academic/Student_Conduct_Code.html

In particular, you are encouraged to read the statements on scholastic dishonesty, disruptive behavior, and the use of electronic devices during exams (see detailed policy descriptions below). Violations of these policies will lead to penalties, up to and including a failing grade “F” in the course and expulsion from the University.

Classroom etiquette: Cell phones must be turned off. Computers may be used only for notetaking, accessing your textbook, or accessing online course resources as required during the lecture (this will be rare). All other forms of electronic communication and web access are not allowed at any time. Note that the use of any electronic devices, except handheld calculators without wireless capability, is forbidden during exams. Lectures will require
active verbal communication (both ways!) between students and the instructor. Anything that impedes this process (from web browsing to reading the newspaper) is rude and disruptive.

COURSE GOALS AND OBJECTIVES

This class provides a rigorous introduction to electricity and magnetism. We will cover: electrostatics, magnetostatics, electronic and magnetic properties of materials, electrodynamics, circuits, Maxwell's equations, and electromagnetic waves. Knowledge of calculus, including vector calculus, is assumed. Additional mathematical tools will be introduced as necessary.

This semester is devoted to building up a complete understanding of electric and magnetic phenomena. As we will see, these two topics are closely intertwined, and they are responsible for much of modern technology, from electronics to optics. Discussions of applications will accompany the lectures. Along these lines, physicists learn their discipline by doing problems, and that is why problem-solving plays such a large role in this course. Testing physical laws and discovering new phenomena are also an essential aspect of physics, which is why the laboratory plays an important role.

GRADING

Your grade in this course will be based on the following components:

Either:
40% - Average of three quizzes
30% - Score on the final exam

OR
30% - Best two of three quizzes
40% - Final Exam

70% of your grade is determined by whichever of the above calculations yields the highest score for you,

AND
20% - Laboratory (note rule on passing the laboratory part of the course as discussed above)
10% - Graded homework assignments

The assigned letter grade for the course will be based ROUGHLY on the following percentages of the maximum possible overall score:
A: 86-100%, B: 72-85%, C: 58-71%, D: 44-57%, F: 0-43%.

These numbers are subject to shifts of a few percent. Each letter grade may further be assigned a plus or minus reflecting its location within the range of percentages; there are no A+ or D- grades.

LIBERAL EDUCATION (required statement as per university policy)

This 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 electricity and magnetism are described with particular emphasis on their application in current technology, using mathematical analysis at the level of 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.

ATTENDANCE POLICY

Attendance at all discussion sections and labs is expected. Note that you must attend and complete all labs in order to pass the course.

DEPARTMENTAL POLICIES

**ATHLETES** must provide their official University of Minnesota athletic letter containing the approved competition schedule to their instructor and the staff in Williamson Hall 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 (see policy below), please provide the staff in Williamson Hall 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.

UNIVERSITY POLICIES

- Student conduct code
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.

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."
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/education/studentresp.

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/education/instructorresp.

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.

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/education/makeupwork.

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/education/studentresp.

**Grading and Transcripts**

The University utilizes plus and minus grading on a 4.000 cumulative grade point scale in
accordance with the following:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Numerical Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.000</td>
<td>Represents achievement that is outstanding relative to the level necessary to meet course requirements</td>
</tr>
<tr>
<td>A-</td>
<td>3.667</td>
<td></td>
</tr>
<tr>
<td>B+</td>
<td>3.333</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>3.000</td>
<td>Represents achievement that is significantly above the level necessary to meet course requirements</td>
</tr>
<tr>
<td>B-</td>
<td>2.667</td>
<td></td>
</tr>
<tr>
<td>C+</td>
<td>2.333</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2.000</td>
<td>Represents achievement that meets the course requirements in every respect</td>
</tr>
<tr>
<td>C-</td>
<td>1.667</td>
<td></td>
</tr>
<tr>
<td>D+</td>
<td>1.333</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>1.000</td>
<td>Represents achievement that is worthy of credit even though it fails to meet fully the course requirements</td>
</tr>
<tr>
<td>S</td>
<td></td>
<td>Represents achievement that is satisfactory, which is equivalent to a C- or better.</td>
</tr>
</tbody>
</table>

For additional information, please refer to:
http://policy.umn.edu/education/gradingtranscripts.

**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.

**Disability Accommodations**

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center 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 Disability Resource Center at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with Disability Resource Center 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 Disability Resource Center website, https://diversity.umn.edu/disability/.

**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.

**Academic Freedom and Responsibility: for courses that do not involve students in research**
Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost. [Customize with names and contact information as appropriate for the course/college/campus.]

* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".