Electricity and Magnetism  
Physics 2220  
Spring 2016

Professor: Duncan Weathers  
Office: Physics Bldg., Room 003  
Telephone: (940) 565-2079  
E-mail: weathers@unt.edu  
Office Hours: Tu 11 a.m – 12 noon, Th 12:30 – 1:30 p.m., and by appointment

Text: Recommended text is *University Physics*, 13th Edition, by Young and Freedman. Students are required to obtain access to MasteringPhysics from Pearson, and to obtain a Responsive Innovations Response Card, Part No. RCRF-01, distributed by Turning Technologies, LLC.  
- **Options with Young/Freedman textbook that include Mastering access:**  
  - Hardcover text with MasteringPhysics access  
  - 3-hole punched edition with MasteringPhysics access  
  - MasteringPhysics access including e-book for Young/Freedman  
Other calculus-based physics texts are acceptable; the successful student will have a text.

Topics: This course will cover electric fields, direct-current and alternating-current circuits, magnetic fields and magnetic induction, electric and magnetic properties of matter, electromagnetic waves, and geometrical and wave optics.

Attendance/Participation: You are expected to attend all lectures and recitations for the section in which you are enrolled; your grade will depend upon your attendance and participation in class. You will be expected to bring your Response Card with you to class, and participate in answering in-class questions.

Exams: There will be three 90-minute exams during the semester, to be given from 4:00 to 5:30 p.m. on Friday afternoons, and a comprehensive final exam, to be given from 4:00 to 6:00 p.m. on Monday, May 9. Exam questions will be based on lecture material, material contained in the text and in the homework assignments. For free-response problems, you must show all your work on your exam paper for full credit. Questions pertaining to the grading of exam questions and problems must be directed to the instructor in writing within two weeks after the exams are returned. **There will be no makeup exams.**

Homework: All homework will be posted, collected, and graded via the internet. You will also be required to turn in written solutions to some of the homework problems, which will be collected weekly and graded. You must access your assignment each week online through the MasteringPhysics website, work the problems, and submit your solutions to the server by the due date indicated online. Your neatly written solutions to the homework problems requiring such must put in the mailbox labeled “2220 – Weathers” near the south end of the 2nd floor hallway in the Physics Building by the same due date and time as for the online homework. It is recommended that you make a copy of your written solutions before submitting them. Details of accessing the homework server are given on the 4th page of this syllabus. Address all problems with the homework server to your instructor.

Grade: The grading in the course will be based on the total points earned from exams, homework, and lecture and recitation attendance/short quizzes. The point values for each category are given below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>15%</td>
</tr>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Lecture &amp; Recitation</td>
<td>6%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Lab Credit: You must enroll separately in Physics 2240 for laboratory science credit.

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must

Note: This document is for informational purposes only and is subject to change upon notification.
obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information see the Office of Disability Accommodation website at [http://www.unt.edu/oda](http://www.unt.edu/oda). You may also contact them by phone at 940.565.4323.

UNT’s policy on Academic Dishonesty can be found at: [http://www.vpaa.unt.edu/academic-integrity.htm](http://www.vpaa.unt.edu/academic-integrity.htm)

### Tentative Lecture Schedule

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Day</th>
<th>Chapter: Lecture Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19 Jan.</td>
<td>Tu</td>
<td>Ch. 21: Electric charges, fields and forces, Coulomb’s Law</td>
</tr>
<tr>
<td>2</td>
<td>20 Jan.</td>
<td>We</td>
<td>(recitations start)</td>
</tr>
<tr>
<td>2</td>
<td>21 Jan.</td>
<td>Th</td>
<td>Ch. 21: Electric field, electric field lines</td>
</tr>
<tr>
<td>3</td>
<td>26 Jan.</td>
<td>Tu</td>
<td>Ch. 22: Electric flux, Gauss’s law and applications</td>
</tr>
<tr>
<td>4</td>
<td>28 Jan.</td>
<td>Th</td>
<td>Ch. 22: Conductors in electrostatic equilibrium</td>
</tr>
<tr>
<td>5</td>
<td>2 Feb.</td>
<td>Tu</td>
<td>Ch. 23: Electric potential energy, electric potential, electric field from potential</td>
</tr>
<tr>
<td>6</td>
<td>4 Feb.</td>
<td>Th</td>
<td>Ch. 23: Electric potential for continuous charge distributions, equipotential surfaces</td>
</tr>
<tr>
<td>7</td>
<td>9 Feb.</td>
<td>Tu</td>
<td>Ch. 24: Capacitance, capacitor networks</td>
</tr>
<tr>
<td>8</td>
<td>11 Feb.</td>
<td>Th</td>
<td>Ch. 24: Energy in capacitors, capacitors with dielectrics</td>
</tr>
<tr>
<td>9</td>
<td>16 Feb.</td>
<td>Tu</td>
<td>Ch. 24: Dielectric materials, electric dipoles</td>
</tr>
<tr>
<td>10</td>
<td>18 Feb.</td>
<td>Th</td>
<td>Ch. 25: Ohm’s law, resistors, electrical power in resistors</td>
</tr>
<tr>
<td>XM1</td>
<td>19 Feb.</td>
<td></td>
<td><strong>Exam 1—Chs. 21-24: Friday, 4:00-5:30 p.m., Art Building Room 223</strong></td>
</tr>
<tr>
<td>11</td>
<td>23 Feb.</td>
<td>Tu</td>
<td>Ch. 26: Resistor networks, Kirchhoff’s rules</td>
</tr>
<tr>
<td>12</td>
<td>25 Feb.</td>
<td>Th</td>
<td>Ch. 26: RC circuits, household wiring, electrical safety</td>
</tr>
<tr>
<td>13</td>
<td>1 Mar.</td>
<td>Tu</td>
<td>Ch. 27: Magnets and magnetic fields, magnetic force on charged particles and wires</td>
</tr>
<tr>
<td>14</td>
<td>3 Mar.</td>
<td>Th</td>
<td>Ch. 27: Torque on current loops, motion of charged particles in magnetic fields, Hall effect</td>
</tr>
<tr>
<td>15</td>
<td>8 Mar.</td>
<td>Tu</td>
<td>Ch. 28: Biot-Savart law, force between current-carrying conductors, Gauss’s law for magnetism</td>
</tr>
<tr>
<td>16</td>
<td>10 Mar.</td>
<td>Th</td>
<td>Ch. 28: Ampere’s law</td>
</tr>
<tr>
<td>—</td>
<td>15 Mar.</td>
<td>Tu</td>
<td>No class — <em>Spring Break</em></td>
</tr>
<tr>
<td>—</td>
<td>17 Mar.</td>
<td>Th</td>
<td>No class — <em>Spring Break</em></td>
</tr>
<tr>
<td>17</td>
<td>22 Mar.</td>
<td>Tu</td>
<td>Ch. 29: Faraday’s law of induction, Lenz’s law</td>
</tr>
<tr>
<td>18</td>
<td>24 Mar.</td>
<td>Th</td>
<td>Ch. 29: Applications of Faraday’s law</td>
</tr>
<tr>
<td>XM2</td>
<td>25 Mar.</td>
<td></td>
<td><strong>Exam 2—Chs. 25-28: Friday, 4:00-5:30 p.m., Art Building Room 223</strong></td>
</tr>
<tr>
<td>19</td>
<td>29 Mar.</td>
<td>Tu</td>
<td>Ch. 30: Inductance, RL circuits, energy in magnetic field</td>
</tr>
<tr>
<td>20</td>
<td>31 Mar</td>
<td>Th</td>
<td>Ch. 30: LC and RLC circuits</td>
</tr>
<tr>
<td>21</td>
<td>5 Apr.</td>
<td>Tu</td>
<td>Ch. 31: Phasors and Reactance, power in AC circuits</td>
</tr>
<tr>
<td>22</td>
<td>7 Apr.</td>
<td>Th</td>
<td>Ch. 31: Transformers, electromagnetic radiation, properties of EM waves,</td>
</tr>
<tr>
<td>23</td>
<td>12 Apr.</td>
<td>Tu</td>
<td>Ch. 32: Maxwell’s equations, EM spectrum</td>
</tr>
<tr>
<td>24</td>
<td>14 Apr.</td>
<td>Th</td>
<td>Ch. 32: Poynting vector, energy and momentum in EM waves <em>(skip section 32.5)</em></td>
</tr>
<tr>
<td>25</td>
<td>19 Apr.</td>
<td>Tu</td>
<td>Ch. 33: Reflection, Refraction</td>
</tr>
<tr>
<td>26</td>
<td>21 Apr.</td>
<td>Th</td>
<td>Ch. 33: Dispersion, polarization, scattering and Huygen’s Principle</td>
</tr>
</tbody>
</table>

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Physics 2220 Core Objectives

This course satisfies the core course requirement by fostering skills associated with four core objectives:

1. **Critical thinking** - analysis, evaluation, and synthesis of information.
2. **Effective communication** - development, interpretation, and expression of ideas through written, oral, and graphical means.
3. **Quantitative skills** - the ability to compute and manipulate quantitative data and to reach meaningful conclusions.
4. **Teamwork** - the ability to consider different points of view and to work effectively as a team.

Physics 2220 Goals and Learning Strategies

The goals of instruction in Physics 2220 are to lead and to guide you to understand and master the fundamentals of elementary electromagnetism and optics, and to develop your skills of analysis using the mathematical tools of algebra and calculus. To help in achieving these goals you are requested to pursue the following strategies:

1. **Read the text chapter within the forty-eight hours prior to the class.** You should bring your questions to class or e-mail to the instructor prior to the morning of the class.
2. **Listen, observe, take notes, analyze, discuss with peers, answer questions, solve in-class problems and respond promptly via the ResponseCard™ technology as directed by your instructor.**
3. **Review your textbook chapter summary and your notes** within twenty-four hours after class.
4. **Work the assigned problems** only after you have read and reviewed the material of the chapter.
5. **Communicate with your instructor** via email at weathers@unt.edu or during office hours whenever you have an observation or question.
6. **Come to class prepared:** bring a calculator, your text book and, above all, your ResponseCard™ in order to participate and take full advantage of the lecture hall learning experience.
7. **Work extra practice problems,** such as from the end-of-chapter problems in the text.

To learn more about campus resources and information on how you can achieve success, go to succeed.unt.edu.

Classroom Participation

In this course we are using an electronic student response system. After you have given the instructor your hand-held keypad identification number, you will be able to respond to questions and polls that the instructor poses during the lecture and receive credit for participation, as well as immediate feedback and assessment of your understanding. Only when you participate via the keypad will you be credited with attending the class, after the first initial enrollment period. The motivation for using this technology is to provide an improved and more effectual learning environment. The procedure will be as follows:

1. **You will see a PowerPoint™ slide presented that asks a question.**
2. **You will be given time to think about the question and select from several possibilities by depressing the letter or number on your keypad corresponding to your choice.**
3. **Your answer will be recorded for the instructor to credit you with participation, and the overall results of the activity can be presented to the class in real time as programmed by the instructor.**
To register your ResponseCard ™ in learn.unt.edu
(a) Login at learn.unt.edu
(b) Select course PHYS2220.001
(c) Click “Course Content”
(d) Click “Register ResponseCard Device ID” and enter six-character serial number located on the back of your keypad, immediately underneath the bar code as shown in the figure. The code can contain letters A-F and digits 0-9 (no letter “o”).

To make your ResponseCard ™ work in the lecture hall:
(1) You must provide the instructor with the six-character serial number located on the back of your keypad (see above).
(2) You must set the keypad channel to match that of the receiver in the lecture hall. Do so by firmly depressing “GO” (lower left button), causing the keypad LED to blink red-green, and then press “7” and “3”, and then press “GO” again. At this point, if the LED is green, you are ready. If the LED continues to flash, repeat the above steps until the LED becomes green.
Note: If your card does not respond at all, the most likely problem is that the batteries have failed. Please see your instructor to have it checked.

Homework Information
In this course you will be using MasteringPhysics®, an online tutorial and homework program.

What You Need:
✓ A valid email address
✓ A student access code (Comes in the Student Access Kit that may have been packaged with your new textbook or you can purchase access online at www.masteringphysics.com. If you already have an access code from a previous semester, it should still be valid.)
✓ The ZIP code for your school: 76203
✓ A Course ID: UNTPHYSICS2220DW16

Register
• Go to www.masteringphysics.com and click New Students under Register.
• To register using the Student Access Code inside the MasteringPhysics Student Access Kit, select Yes, I have an access code. Click Continue.
• Purchase access online: Select No, I need to purchase access online now. You will be asked to select your textbook—choose Young/Freedman University Physics 13e or 14e, but you don’t need to purchase the e-book. Click Continue. Follow the on-screen instructions to purchase access using a credit card. The purchase path includes registration, but the process may differ slightly from the steps printed here.
• License Agreement and Privacy Policy: Click I Accept to indicate that you have read and agree to the license agreement and privacy policy.
• Select the appropriate option under “Do you have a Pearson Education account?” and supply the requested information. Upon completion, the Confirmation & Summary page confirms your registration. This information will also be emailed to you for your records. You can either click Log In Now or return to www.masteringphysics.com later.

Log In
• Go to www.masteringphysics.com.
• Enter your Login Name and Password and click Log In.

Enroll in Your Instructor’s Course and/or Access the Self-Study Area
Upon first login, you’ll be prompted to do the following:
• Join your MasteringPhysics course by entering the Course ID: UNTPHYSICS2220DW16
• Click Save and OK.

To access your course from now on, simply go to www.masteringphysics.com, enter your Login Name and Password, and click Log In. If your instructor has created assignments, you can access them in the Assignments Due Soon area or by clicking View All in this area. Otherwise, click on Study Area to access self-study material.

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Support
Access Customer Support at www.masteringphysics.com/support, where you will find:

- System Requirements
- Answers to Frequently Asked Questions
- Additional contact information for Customer Support, including Live Chat

Please note that some problems in any given assignment may not be for credit. You can identify which problems are for credit by looking at the point value immediately after the problem number. The problems assigned zero credit are for your extra practice if you choose to take advantage of them, which you are encouraged to do.

You will also be required to submit written solutions to some of the assigned problems, which will be collected weekly and graded. Your neatly written solutions to all the homework problems that require written work must be turned in to the mailbox labeled “2220 – Weathers” near the south end of the 2nd floor hallway in the Physics Building by the same due date and time as for the homework on the server. It is recommended that you use loose-leaf paper and just turn in one week’s work at a time because of space restraints, and that you photocopy your work before handing it in. Be sure to staple all your work together and put your name and the assignment number on your papers. Your graded work will be returned to you in the alphabetized column of open boxes labeled “Physics 2220” to the right of where homework is handed in. Every effort will be made to return graded homework to these boxes within one week of the due date. Homework problems and related problems will be discussed in recitation.

Homework grading policy:

a. The computer-generated score is to be the starting point for determining your grade.

b. If you have earned computer credit for a problem, you must show sufficient work in your written HW to retain that credit. For each such problem, the grader will verify that:
   i. there is an explanation of the problem’s solution in your written work;
   ii. the solution presented is reasonable, i.e., essentially correct as shown;
   iii. there is sufficient detail in the explanation to allow someone to understand all the steps of the solution.

   If these three conditions are clearly not met, then you will receive reduced or no credit for the problem.

c. If you are unsuccessful in obtaining the correct numerical solution to a problem, but have done work that you believe to be conceptually correct, indicate clearly on your written solutions that you would like the problem to be graded for partial credit. These problems will be graded on the basis of the correctness of the work presented, and may be assigned up to 90% of full credit.

Ancillary Materials

Blackboard Learn will be used to post some useful course materials and your grades. To get to this resource, go to http://learn.unt.edu and follow the UNT link to log on. (You will log on using your UNT EUID and password.) Once logged on, select this course. You will find an electronic copy of this syllabus, copies of the PowerPoint presentations from lecture, extra problems with solutions for practice, copies of old exams with keys, the equation sheets for exams, and you will be able to access your exam and quiz grades.

Also available for your extra problem-solving practice is a text similar to the one used for this class, with a full set of solutions for all of the problems in the backs of the chapters. These materials are on reserve in Willis Library.

Tutors are on staff from in Physics Room 209 from 10 a.m. to 6 p.m. M Tu, 10 a.m. to 8 p.m. W Th, and 10 a.m to 4 p.m. F, to assist you with questions related to solving homework problems.

Course Evaluation – Student Perceptions of Teaching (SPOT)

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The short SPOT survey will be made available April 18th – May 1st to provide you with an opportunity to evaluate how this course is taught. For the spring 2016 semester you will receive an email on April 18th (12:01 a.m.) from “UNT SPOT Course Evaluations via IASystem Notification” (no-reply@iasystem.org) with the survey link. Please look for the email in your UNT email inbox. Simply click on the link and complete your survey. Once you complete the survey you will receive a confirmation email that the survey has been submitted. For additional information, please visit the spot website at www.spot.unt.edu or email spot@unt.edu.

Note to Members of TAMS

Note: This document is for informational purposes only and is subject to change upon notification.
The Texas Academy of Mathematics and Science (TAMS) administration has made the following statement and has asked us to include it in our syllabus for members of the Academy:

“Class attendance and participation is required. Students must be alert, attentive, energetic, and eager to learn. Students who exhibit disruptive behavior or show disrespect to a teacher in the classroom are subject to severe disciplinary sanctions. The Academy does not authorize absences from class. Students must report all absences to the Academic Office within 36 hours of the absence by completing a form in the Academic Office. A student will be assessed 5 disciplinary points for each class absence, unless the absence can be justified. Faculty will also be reporting absences to the Academic Office. A student will be assessed 15 disciplinary points for failure to report an absence that is reported by a faculty member.”

If you are a TAMS student and if you are absent for any reason, you are required to file an absence report with the TAMS Academic Office in Marquis Hall 134.