Electricity and Magnetism
Physics 2220
Spring 2017

Lecture Section 002, Physics Room 102, MoWeFr 1:00 - 1:50 pm
Recitation Section-202 Mon./Weds. 4-4:50 p.m. Gate 131, TA instructor
Recitation Section-205 Mon./Weds. 3-3:50 p.m. Gate 131, TA instructor
Recitation Section-206 Fr. 2-3:50 p.m. BLB 060, TA instructor

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Office Hours: MoWeFr 12:30-1:00 pm, 1:50 –2:20 pm, and by appointment

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Text: Recommended text is University Physics, 13th Edition, by Young and Freedman (14th Edition is also OK). Students are required to obtain access to MasteringPhysics from Pearson.

- **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 participate in answering in-class questions and take in-class quiz. The in-class quiz will be counted toward your attendance.

Exams: There will be three 90-minute exams during the semester, to be given starting at 4:00 p.m. on Friday afternoons, and a comprehensive final exam following UNT official exam schedule. Exam questions will be based on lecture material, material contained in the text and in the homework assignments. You must show all of your work on your exam papers for full credit for free-response questions. 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. **If you have a scheduled course conflict with the exam times, contact your instructor about an alternate examination time. There will be no makeup exams.**

Homework: All homework will be posted, collected, and graded via the internet. You will also be required to keep a homework notebook with your written solutions, which will be collected weekly and graded. You must download your assignment each week, work the problems, and submit your solutions to the server by the due date indicated on the server. Your neatly written solutions to all the homework problems must put in the mailbox labeled "**2220 – Lin**" 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. Details of accessing the homework server are given on the 4th page of this syllabus. Address all problems with the homework server to your teaching assistant. Selected homework problems will be discussed in recitation.

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:

Exams	1st exam **15%**; 2nd exam **15%**; 3rd exam **15%**; **30%** for the final;
Homework	**14%**
Lecture & Recitation	**7%** for lecture participation, **4%** for recitation quizzes
Total	**100%**

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

Disability Accommodation: 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 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. 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
Cheating, plagiarism or other forms of academic dishonesty on an exam or final will result in a grade of zero on the exam or final, and possibly an additional reduction in course letter grade. **In the examination room, all electronic devices except calculator must be off and put away (in your backpack). When you enter the room, place your backpacks in the front of the room and take pencils and calculators to your seat. No phone calculators are allowed.**

Drop information is available in the schedule of classes at:
http://registrar.unt.edu/registration/schedule-of-classes

Physics 2220.002
Tentative Lecture Schedule

Session	Date	Day	Chapter:	Lecture Topic
1	18 Jan.	We	Ch. 21:	Electric charges, fields and forces
2	20 Jan.	Fr	Ch. 21:	Coulomb's law, Electric field
3	23 Jan.	Mo	Ch. 21:	Electric field, electric field lines
4	25 Jan.	We	Ch. 22:	Electric flux, Gauss's law
5	27 Jan.	Fr	Ch. 22:	Applications of Gauss's law
6	30 Jan.	Mo	Ch. 22:	Conductors in electrostatic equilibrium
7	1 Feb.	We	Ch. 23:	Electric potential energy, electric potential
8	3 Feb.	Fr	Ch. 23:	Electric field from potential, Electric potential for continuous charge distributions
9	6 Feb.	Mo	Ch. 23:	Equipotential surface
10	8 Feb.	We	Ch. 24:	Capacitance, capacitor networks
11	10 Feb.	Fr	Ch. 24:	Capacitor networks, energy in capacitors
12	13 Feb.	Mo	Ch. 24:	Capacitors with dielectrics
13	15 Feb.	We	Ch. 24:	Dielectric materials, electric dipoles
14	17 Feb.	Fr	Ch. 25:	Ohm's law
XM1	**17 Feb.**	**Exam 1—Chs. 21-24: Friday, 4:00-5:30 p.m., ART 223**		
15	20 Feb.	Mo	Ch. 25:	Resistors, electrical power in resistors
16	22 Feb.	We	Ch. 26:	Resistor networks
17	24 Feb	Fr	Ch. 26:	Kirchhoff's rules, RC circuits
18	27 Feb.	Mo	Ch. 26:	RC circuits, household wiring, electrical safety
19	1 Mar.	We	Ch. 27:	Magnets and magnetic fields
20	3 Mar.	Fr	Ch. 27:	Magnetic force on charged particles and wires
21	6 Mar.	Mo	Ch. 27:	Torque on current loops
22	8 Mar.	We	Ch. 27:	Motion of charged particles in magnetic fields, Hall effect
23	10 Mar.	Fr	Ch. 28:	Biot-Savart law, force between current-carrying conductors, Gauss's law for magnetism
—	13 Mar.	Mo	No class – Spring Break	
—	15 Mar.	We	No class – Spring Break	
—	17 Mar.	Fr	No class – Spring Break	
24	20 Mar.	Mo	Ch. 28:	Ampere's law
25	22 Mar.	We	Ch. 29:	Faraday's law of induction
26	24 Mar.	Fr	Ch. 29:	Lenz's law
XM2	**24 Mar.**	**Exam 2—Chs. 25-28: Friday, 4:00-5:30 p.m., ART 223**		
27	27 Mar.	Mo	Ch. 29:	Applications of Faraday's law
28	29 Mar.	We	Ch. 30:	Inductance, RL circuits, energy in magnetic field

29	31 Mar.	Fr	Ch. 30: RL circuits
30	3 Apr.	Mo	Ch. 30: LC and RLC circuits
31	5 Apr.	We	Ch. 31: Phasors and Reactance
32	7 Apr.	Fr	Ch. 31: Power in AC circuits and transformers
33	10 Apr.	Mo	Ch. 31: Tansformers, electromagnetic radiation, properties of EM waves,
34	12 Apr.	We	Ch. 32: Maxwell's equations
35	14 Apr.	Fr	Ch. 32: Maxwell's equations and EM spectrum
36	18 Apr.	Mo	Ch. 32: Poynting vector, energy and momentum in EM waves (skip section 32.5)
37	20 Apr.	We	Ch. 33: Reflection, Refraction
38	22 Apr.	Fr	Ch. 33: Dispersion
XM3	**21 Apr.**		**Exam 3—Chs. 29-32: Friday, 4:00-5:30 p.m., ART 223**
39	24 Apr.	Mo	Ch. 33: Polarization, scattering and Huygens's Principle
40	26 Apr.	We	Ch. 34: Image formation by surfaces
41	28 Apr.	Fr	Ch. 34: Image formation by surfaces, lens (skip sections 34.5-34.8)
42	1 May	Mo	Ch. 35: Interference and two-source interference
43	3 May	We	Ch. 35: Interference patterns and **Review**
FINAL	**6 May**		**Final Exam—Comprehensive: Saturday, 10:30 a.m. - 12:30 p.m., Location: PHYS 102**

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) During class, **listen, observe, take notes, analyze, discuss with peers, and answer questions, solve in-class problems.**
(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) **Respond via e-mail** to yuankun.lin@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, to participate and take full advantage of the lecture hall learning experience.

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.)
- ✓ The ZIP code for your school: **76203**
- ✓ A Course ID: **UNTPHYS2220LIN2017**

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**.

–OR– **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**, 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 one or more of the following:

- **Join your MasteringPhysics course** by entering the **Course ID** provided by your instructor**.**
- Enter your **UNT EUID (for example: yl0312),** if prompted.

Click **Save** and **OK**.

Congratulations! You have completed registration and have enrolled in your instructor's MasteringPhysics course. 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.

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 keep a homework notebook with your written solutions, which will be collected weekly and graded. Your neatly written solutions to all the homework problems must be turned in to the mailbox labeled "**2220 –Lin**" 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. Be sure to staple all your work together and **put your name 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. It is recommended that you photocopy your work before handing it in.

Selected homework 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

Note: This document is for informational purposes only and is subject to change upon notification.

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 Power Point presentations from lecture, 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 the Science and Technology Library.

A **Help Room** (location to be announced) is staffed weekday afternoons by a teaching assistant to assist you with questions regarding any aspect of the course, including homework assignments. Hours will be posted on the door of the Help Room, as well as at the beginning of lecture. TA contact information will also be posted on the Help Room Door.

Course Evaluation

The Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT. This short survey will be made available to you on-line at the end of the semester and will provide you with an opportunity to provide feedback to your course instructor. SPOT is considered to be an important part of your participation in this class. In addition to SPOT, there will be a brief in-class course survey during the last two weeks of the semester.

For the Spring 2017 semester you will receive an email in April 2017 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.

After logging in to the my.unt.edu portal, students can access the SPOT survey site by clicking on the SPOT icon. A list of their currently enrolled courses will appear. Students complete each course evaluation independently. During the long terms, the SPOT is open for students to complete two weeks prior to final exams. During the summer terms, the SPOT is open for students to complete six days preceding their final exam. See SPOT Calendar for specific dates and deadlines.

Note to Members of TAMS

The Texas Academy of Mathematics and Science (TAMS) administration has made the followings 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.

Physics 2220 Core Course

Core course objectives: In this course, students focus on describing, explaining, and predicting natural phenomena using the scientific method. Strong emphasis is placed on student understanding of interactions among natural phenomena and the implications of scientific principles on the physical world and on human experiences.

PHYS 2220 contributes the following core course learning objectives:
(1) **Critical thinking**
Students will gain the ability to use the knowledge of mathematics and the basic physical laws of nature to solve physics problems. This skill requires creative thinking and innovation to identify and apply appropriate models to analyze physical phenomena.
(2) **Effective communication**
Students will gain proficiency in communicating ideas effectively in graphical and written form through submission of written homework solutions, examinations, and lab reports; and in oral form through question-answer problem-solving recitation sessions, occasional in-class discussion of concepts and experiments, and in conducting laboratory experiments, where they work together in small groups.
(3) **Quantitative skills**
Students will interpret and analyze observable facts and data to understand physical systems, and will have extensive practice applying algebra, geometry, trigonometry, and differential and integral calculus in their analyses. In the laboratory exercises, students must measure, compile, organize and analyze numerical data and ultimately draw conclusions about their findings as part of the laboratory objectives.
Note: This document is for informational purposes only and is subject to change upon notification.

(4) **Teamwork**
Students work in small teams to conduct laboratory experiments and interpret the results. Students will need to consider different points of view and work effectively with others to deliver a satisfactory report.

Detail 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:

- Calculate the electric field or potential of point charges and continuous charge distributions.
- Understand and apply Gauss's law.
- Calculate the magnetic field from continuous current distributions.
- Understand the meaning and application of the integral form of Maxwell's equations.
- Analyze simple DC circuits involving resistors, capacitors and inductors.
- Compute the time constants for RC, RL and RLC circuits.
- Trace rays through simple optical systems involving mirrors and lenses.