

Electricity and Magnetism

Physics 2220

Spring 2023

Lecture Section 001, MTuWTh 1:30–3:20 PM in Phys 102
Recitation sections: .201, .202

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Pronouns: He, him, his
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Office Hours: Mondays, 12:30-1:30 PM, by appointment, or any time my door is open

Welcome! As members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation. Everyone should feel comfortable being their authentic selves in our class. If you have any questions or concerns, do not hesitate to contact me.

Communication: This is a face-to-face class with no Zoom component. All course materials (handouts, lecture slides, etc.) and announcements will be posted in Canvas. You can contact me via email at alexander.barr@unt.edu or by sending a message in Canvas. In most cases, you can expect to receive a response within 24 hours. You are also always welcome to come by my office during office hours or at other times. You are expected to check your UNT email and Canvas messages at least once a day.

Course Objectives: This course will cover electric fields, direct-current and alternating-current circuits, magnetic fields and magnetic induction, electric and magnetic properties of matter, and electromagnetic waves. Students will learn how to:

- Calculate the electric field and electric potential of point charges and continuous charge distributions
- Calculate the magnetic field from continuous current distributions
- Apply Newton's laws and conservation of energy and momentum to problems involving electric charges and current-carrying wires
- Explain the meaning and application of the integral form of Maxwell's equations
- Analyze AC and DC circuits involving resistors, capacitors, and inductors

PHYS-2220 contributes to the following core course learning objectives:

- **Critical Thinking:** Creative thinking, analysis, evaluation, and synthesis of information
- **Communication:** Development, interpretation, and expression of ideas through written, oral, and graphical means
- **Quantitative Skills:** Manipulate and analyze data to reach meaningful, informed conclusions
- **Teamwork:** Consider different points of view and work effectively with others to support a shared purpose or goal

Course Pre-requisites: Students must complete PHYS-1420 (General Physics II) or PHYS-1710 (Mechanics) before enrolling in this course. MATH-1720 (Calc II) must be taken before or concurrently with this course.

Textbook and Online Homework System: The recommended textbook is *University Physics*, 15th Edition, by Young and Freedman. Other calculus-based introductory physics textbooks are acceptable including the free [OpenStax University Physics II](#) online textbook. **You are required to purchase access to the Mastering Physics online homework system.** If you took PHYS-1710 at UNT and purchased the 24 month Mastering Physics access, that same access will still be good for PHYS-2220 and you do not need to buy anything new.

Options available through the UNT bookstore:

- 24-month Mastering Physics access including access to the e-textbook - \$190
- 18-week Mastering Physics access including access to the e-textbook - \$110

Attendance and Participation: You are expected to attend and participate in all lectures and recitations for the section in which you are enrolled as long as you are healthy. Recitations will frequently involve quizzes or group activities that cannot be made up if you are absent. If you are sick or know that you will miss an upcoming class, let the instructor know as soon as possible to see what arrangements can be made.

Exams: There will be three exams given during class in the lecture classroom at the dates indicated on the schedule at the end of the syllabus. The comprehensive **final exam is on Friday, July 25 from 1:30 – 3:30 PM in the lecture room**. Exam questions will involve both mathematical calculations and conceptual explanations and will be based on material from lecture, recitation, and homework assignments.

- No exam scores will be dropped.
- Questions pertaining to the grading of exams must be directed to the instructor in writing within one week of receiving your graded exam.
- If you have a pre-scheduled commitment that conflicts with one of the exams, contact the instructor as soon as possible.

Homework: All homework will be posted and submitted online using Mastering Physics. Mastering Physics allows 6 submission attempts for each problem. Homework is intended to be practice so there is no penalty for an incorrect answer as long as you arrive at the correct answer in 6 attempts or less.

Late Homework: If an extension is not requested within 24 hours of the due date, there is a 5% deduction per day. A 24 hour homework extension can be requested using the link on Canvas.

Mastering Physics Instructions: Go to our Canvas page and click Access Pearson then Open Pearson then MyLab & Mastering. If you have already paid for access to Mastering Physics, use the same username and password to access Pearson through Canvas. If you do not have a username and password, you can set that up and enter your access code (from the bookstore) when accessing Pearson through Canvas.

Physics Resource Center (PRC): A Help Room in Hickory Hall 266 is staffed M-Th 10am-4pm by tutors to assist you with questions regarding class, homework, or lab. This is a free service and does not require any reservations or prior planning - just drop in. There is plenty of seating and computers in the PRC so you can go there to work on your homework and have tutors available nearby if you get stuck.

Learning From Mistakes: Learning necessarily involves making mistakes. If you never make mistakes then you are not being sufficiently challenged. The goal is to make most of your mistakes on the homework and during in-class practice so that you can ask questions and review your notes/textbook to learn from those mistakes before you get to the exam. When you make a mistake on an exam, your goal is still to understand what you did wrong and to learn from that mistake.

Opportunities to practice and demonstrate your skills:

- In-class practice
- Recitation practice
- Homework
- Unit Exam
 - Your unit exam score can replace 1 recitation score from that unit.
- Final Exam
 - If your final exam score is higher than one or more of your unit exam scores, those unit exam scores will be replaced with a weighted average of your original exam score and your final exam score.
 - If your final exam score is lower than the average of your three unit exam scores, your final exam score will be replaced with a weighted average of your unit exam average and your final exam score.

Course Grades: Course grades will be calculated as follows

iClicker	3%
Pre-Lectures	5%
Homework	10%
Recitation	10%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	27%

Exams scores will not be curved. Semester grades will be rounded to the nearest percent: $\geq 90\%$ = A, 80-89% = B, 70-79% = C, 60-69% = D.

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

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

- Complete the Pre-Lecture reading and quiz prior to class. As you read, write down questions to ask in class.
- Come to class prepared - bring a pen and paper to take notes and a calculator for in-class problem solving.
- During class, listen, observe, take notes, attempt each problem yourself, discuss with peers, ask questions, be willing to make mistakes and volunteer tentative ideas during class discussions.
- Summarize the main ideas from class aloud or in writing within 24 hours of class.
- Set your notes and textbook aside while working on homework. Review your book or notes when you get stuck, but then put them aside again and try to solve the problem on your own.
- Email the instructor, visit office hours, and utilize the Physics Resource Center when you have questions.
- Form a homework and study group with classmates. Meet weekly to work on homework, not just the night before an exam.
- Work extra problems from the learning goals or end-of-the-chapter problems in the textbook.

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. You will receive an email from "UNT SPOT Course Evaluations" from no-reply@iasystem.org with the survey link. You will have separate SPOT evaluations for lecture, recitation, and lab. During fall and spring semesters SPOT surveys are open to students to complete two weeks prior to final exams.

UNT Policies

Academic Integrity Standards and Consequences: According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ADA Accommodation Statement: UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of 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 accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

Emergency Notification & Procedures: UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Sexual Assault Prevention: UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT's Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at

oeo@unt.edu or at (940) 565 2759.

TAMS Students: 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 in Marquis Hall 134.

Tentative Schedule on the next page...

Class	Ch: Lecture Topics	Recitation (TuTh)	What's Due
M - 6/23	Ch. 21: Charging, Coulomb's law, \vec{E} field	XXXXXXXXXXXXXXXXXX	
Tu - 6/24	Ch. 22: Electric flux, Gauss's law	Coulomb's law	Pre-Lecture 2, HW 1
W - 6/25	Ch. 22-23: Potential, Work, Potential energy, Conductors	XXXXXXXXXXXXXXXXXX	Pre-Lecture 3
Th - 6/26	Ch. 23-24: Equipotentials, relating \vec{E} and V, Capacitors	Work and Potential Energy	Pre-Lecture 4, HW 2
M - 6/30	Ch. 24: Dielectrics, Capacitor networks	XXXXXXXXXXXXXXXXXX	HW 3
Tu - 7/1	Ch. 25: Ohm's law, R_{eq} , Power	Unit 1 Summary	Pre-Lecture 5
W - 7/2	Exam 1 (Ch. 21-23, HW 1-3)	XXXXXXXXXXXXXXXXXX	
Th - 7/3	Ch. 25: Kirchoff's laws	Kirchoff's laws	Pre-Lecture 6, HW 4
M - 7/7	Ch. 26: RC Circuits	XXXXXXXXXXXXXXXXXX	HW 5
Tu - 7/8	Ch. 26: RC Circuits continued	RC Circuits	
W - 7/9	Ch. 27: Magnetic force and torque	XXXXXXXXXXXXXXXXXX	Pre-Lecture 7, HW 6
Th - 7/10	Ch. 28: Ampere's law	Unit 2 Summary	Pre-Lecture 8, HW 7
M - 7/14	Exam 2 (Ch. 24-27, HW 4-7)	XXXXXXXXXXXXXXXXXX	
Tu - 7/15	Ch. 29: Lenz's and Faraday's laws	Induced current	HW 8
W - 7/16	Ch. 30: Inductance, RL circuits, energy in B fields	XXXXXXXXXXXXXXXXXX	
Th - 7/17	Ch. 31: AC circuits	LRC Calculations	Pre-Lecture 9
M - 7/21	Ch. 31: Transformers, review	XXXXXXXXXXXXXXXXXX	HW 9
Tu - 7/22	Ch. 31: Maxwell's equations	Unit 3 Summary	HW 10
W - 7/23	Exam 3 (Ch. 28-31, HW 8-10)	XXXXXXXXXXXXXXXXXX	
Th - 7/24	Review	Review	
F - 7/25	Final Exam (Cumulative)	XXXXXXXXXXXXXXXXXX	

*Pre-lecture assignments are always due at the start of class and HW assignments are always due at 11:59 pm