

PHYS 361

Electromagnetic Theory

Spring 2023

Course #13313 (3 credits)

Instructor: Dr. Alan R. Denton alan.denton@ndsu.edu
Professor, Dept. of Physics office: SE 214B, NDSU

Classes: TTh, 9:30-10:45 am, SE 221 **Help:** on demand, in-person or on Zoom

Bulletin Description:

Electrostatics, magnetostatics, dielectrics, electric circuits, time varying electric and magnetic fields, electromagnetic induction, and application of Maxwell's equations.

Prerequisites: PHYS 252, MATH 266, basic knowledge of math methods and mechanics

Objectives: Students will master the foundations of electrodynamics and learn to apply theoretical and computational methods to model a variety of physical systems, including ionic solutions, plasmas, metals, and dielectric and magnetic materials.

Format: Students are expected to review assigned resources in advance and attend class prepared to discuss and work through guided exercises. You are not expected to fully understand the material before class, but be familiar with terminology and definitions. In this way, class time can be used more effectively to deepen conceptual understanding, strengthen problem-solving skills, and discuss practical relevance and applications.

Textbook: D. J. Griffiths, *Introduction to Electrodynamics*, 4th ed. (Cambridge, 2017)

Inclusive Access: To avoid charges, you must opt out before the Bookstore's deadline.

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| Evaluation: | Homework | 100 pts | |
| | Exams | 150 pts | (3 midterms and a final exam) |
| | Quizzes | 50 pts | |
| | <u>Total</u> | <u>300 pts</u> | |

Attendance is expected: NDSU Policy 333, www.ndsu.edu/fileadmin/policy/333.pdf
Class attendance and participation are strongly correlated with success in this course!

Homework: Assignments will be posted on Blackboard (<https://bb.ndsu.nodak.edu>). While discussion of homework with classmates is encouraged, submitted work must be your own. Similarity to work of other students or to internet solutions will yield no points.

Quizzes: Reading quizzes will be posted on Blackboard.

Grading: A: $\geq 85\%$, B: 70 to $< 85\%$, C: 55 to $< 70\%$, D: 40 to $< 55\%$, F: $< 40\%$
Grades will not be curved and any shift in grade boundaries will be only in your favor.

Health and Safety Expectations

Do not come to class if you are sick or, if infected by COVID-19, during your five-day isolation period. Do not come to class if you have been exposed to individuals who tested positive for COVID-19 and/or you have been notified to self-quarantine due to exposure. See attached COVID-19 Related Information. Should any circumstances necessitate strictly online instruction, all course resources will remain accessible through Blackboard and communications and interactive discussions will continue via email and Zoom.

PHYS 361 Preliminary Schedule (Spring 2023)

| Week | Topic | Chapter(s) |
|-------------------|---------------------------------|------------|
| 1 | Vector Analysis | 1 |
| 2 | Vector Analysis, Electrostatics | 1, 2 |
| 3 | Electrostatics | 2 |
| 4 | Electrostatics, Potentials | 2, 3 |
| 5 | Potentials | 3 |
| February 9 | Midterm Exam 1 | 1–3 |
| 6 | Potentials | 3 |
| 7 | Electric Fields in Matter | 4 |
| 8 | Electric Fields in Matter | 4 |
| 9 | Magnetostatics | 5 |
| 10 | Magnetostatics | 5 |
| March 23 | Midterm Exam 2 | 3–5 |
| 11 | Magnetic Fields in Matter | 6 |
| 12 | Magnetic Fields in Matter | 6 |
| 13 | Electrodynamics | 7 |
| 14 | Electrodynamics | 7 |
| April 27 | Midterm Exam 3 | 5–7 |
| 15 | Conservation Laws | 8 |
| 16 | Electromagnetic Waves | 9 |
| May 9 | Final Exam (1-3 PM) | 1–9 |

Computational Examples and Exercises

To supplement “textbook-style” problems, deepen conceptual understanding, and build computational skills, we will use *PhET Interactive Simulations* from the University of Colorado Boulder, *Mathematica*, and *Simulations in Physics* in the Open Source Physics Library, free Java software that can be downloaded, compiled, and run on any computer.

The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

All access to NDSU computers must respect NDSU Senate Policy, section 158:

Acceptable use of Electronic Communication Devices

<https://www.ndsu.edu/fileadmin/policy/158.pdf>

Any students with disabilities or other special needs, who need special accommodations in this course are invited to share concerns or requests with the instructor and to contact the Disability Services Office (www.ndsu.edu/disabilityservices) as soon as possible.