Course Outline
Physics 433-002: Electromagnetism II
Spring 2025

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Lectures: Tuesdays and Thursdays, 1:00 – 2:20 pm, FMH 108.

Office Hours: Tuesdays and Thursdays 11:00 am – 12:00 pm, or by appointment.

Course Website: The course's Canvas page will be the main source of information and communication outside of the classroom.

Textbook: *Introduction To Electrodynamics*, 5th Edition, David J. Griffiths, Cambridge. University Press, ISBN-13: 978-1-00-939775-9.

The textbook has many problems to help you understand the material. Some of these problems are more difficult than others; Griffiths uses notation to distinguish the *very* difficult problem. I recommend that you do as many of these problems as you can.

Prerequisites: Physics 432 with a letter grade of C or better.

Course Description: This course focuses on the electromagnetic force, builds on and is a continuation of Physics 432. This course employs mathematical treatments including differential, integral, and vector calculus to explore a variety of topics including electrodynamics, electromagnetic waves, potentials and fields, radiation, and relativity.

Course Objectives: Upon completion of this course, students will be able to:

- Describe the electric currents in conductors due to electric fields using Ohm's law.
- Describe electromagnetic induction due to changing magnetic fields. Calculate the induced electric field in several situations using Faraday's law.
- Recognize Maxwell's equations as the complete and unified description of electromagnetism. Describe the meaning of the different terms in the equations and the expression of Maxwell's equations in the presence of matter.
- Describe the conservation of charge. Evaluate energy, momentum, and angular momentum of radiation in certain situations.
- Identify electromagnetic waves as solutions of Maxwell's equations. Describe the propagation of these waves both in vacuum and in matter. Explain polarization of waves.

- Describe electromagnetic phenomena using advanced and retarded potentials. Use potentials to describe the field generated by a moving point charge.
- Analyze the electromagnetic dipolar radiation generated by a distant radiating source.
- Calculate physical properties in situations where the Special Theory of Relativity is relevant. Explain why Electromagnetism is a Relativistic Field Theory.

Course Expectations: You, the students, can expect me to:

- treat each student with dignity and respect.
- promote and support a safe and nurturing learning environment.
- be punctual and use class time effectively.
- work to make each lecture effective and impactful.
- be available to student inquiries, comments, and concerns during office hours.
- be available, as much as possible, for ad hoc appointments for students outside of normal office hours.

Academic Integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Generative AI: Generative AI can be a valuable learning tool in this class by assisting with brainstorming, clarifying concepts, and providing feedback on drafts. It can help students explore ideas, refine their understanding, and enhance critical thinking. However, it should not be used to complete assigned work, ensuring authentic learning and integrity.

Honor Code Violations or Disruptive Behavior: NJIT has a zero-tolerance policy for cheating of any kind and for disruptive student behavior. Violations will be reported to and judged by the Dean of Students. The penalties range from failure in the course plus disciplinary probation up to expulsion from NJIT. Avoid situations where your own behavior could be misinterpreted as dishonorable.

- Students are required to agree to the NJIT Honor Code on each quiz and exam.
- Turn off all phones, wireless devices, laptops, and messaging devices, etc.., during quizzes and exams unless instructed otherwise.
- Please refrain from eating and drinking during lecture or create noise in class that interferes with the work of other students or instructors.

- Do not contact any “tutoring services” for help during an exam. This is strictly forbidden.

Attendance: You will not be required to attend class; I will not be taking attendance. However, it is highly recommended that you attend class as much as possible. *If you are sick or feeling unwell, please do not attend class.*

Missed Quizzes and Exams: The general policy is that students who miss an exam will receive a score of zero for that exam. That score will be included in the calculation of their final grade. Students who anticipate an absence from a common exam should discuss their situation with the Dean of Students and their Instructor prior to their absence. To receive an "excused absence" for the exam (a very rare occurrence), the student must present documentation to the Dean of Students and/or their Instructor justifying their absence. The Instructor and the Dean of Students must concur in permitting an "excused absence" for the exam.

Withdrawal: If you must withdraw from the course, do it officially through the Registrar before the last withdrawal date. If you simply stop attending and taking exams your instructor will have to assign a failing grade in the course.

Homework Assignments: There will be regular homework assignments, based on the textbook’s suggested problems. Independent and original solutions to the assigned problems are to be submitted to the instructor either physically or electronically by the assignment’s due date.

Lecture Quizzes: We will have weekly quizzes starting in the second week of the course. The quiz will cover the previous week’s material and will take place during the final 15-20 minutes of lecture. Quiz problems will be open-ended. Quizzes will be “open book”, but you will not be allowed to use your notes. For this reason, I would recommend not purchasing an electronic copy of the textbook as you will not be allowed to use your laptop/tablet/etc... during quizzes.

Midterm: We will have one midterm exam, tentatively scheduled for March 7, 2024 during the regular lecture period, covering Chapters 7, 8, and 9 (inclusive), which may be adjusted depending on how quickly we move through the material. Exam questions will be open-ended.

Grading: Homework Assignments: 20%; Lecture Quizzes: 20%; Midterm Exam: 30%; Final Exam: 30%

Letter grade cutoffs:

≥85%	A
≥80%	B+
≥70%	B
≥65%	C+
≥50%	C
≥40%	D
<40%	F

Course Schedule: We will try our very best to stick to the following course schedule. Please note that some lectures will likely be virtual to accommodate my work travel schedule during the semester. Lectures which are tentatively scheduled to be virtual are noted with a **(V)** symbol. The students will be given adequate notice if any other virtual lectures are required during the semester.

Lecture	Topic	Textbook Chapter Material
1. Tuesday 01/21	Electrodynamics	7.1
2. Thursday 01/23	Electrodynamics	7.2
3. Tuesday 01/28	Electrodynamics	7.3
4. Thursday 01/30	Electrodynamics	7.1-7.3
5. Tuesday 02/04	Conservation Laws	8.1
6. Thursday 02/06	Conservation Laws	8.2
7. Tuesday 02/11	Conservation Laws	8.2
8. Thursday 02/13	Conservation Laws	8.3
9. Tuesday 02/18	Conservation Laws	8.1-8.4
10. Thursday 02/20	Electromagnetic Waves	9.1
11. Tuesday 02/25	Electromagnetic Waves	9.2
12. Thursday 02/27	Electromagnetic Waves	9.3
13. Tuesday 03/04	Electromagnetic Waves	9.4
14. Thursday 03/06	Electromagnetic Waves	9.5
15. Tuesday 03/11	Electromagnetic Waves	9.1-9.5
Thursday 03/13 **Midterm covering Chapters 7 – 9 (inclusive)**		
16. Tuesday 03/25	Potential and Fields	10.1
17. Thursday 03/27	Potential and Fields	10.2
18. Tuesday 04/01	Potential and Fields	10.3
Monday 04/07 **Last Day to Withdraw**		
19. Tuesday 04/08 **(V)**	Potential and Fields	10.1-10.3
20. Thursday 04/10 **(V)**	Radiation	11.1
21. Tuesday 04/15	Radiation	11.2

22. Thursday 04/17	Radiation	11.1-11.2
23. Tuesday 04/12	Electrodynamics and Relativity	12.1
24. Thursday 04/24	Electrodynamics and Relativity	12.1
25. Tuesday 04/29	Electrodynamics and Relativity	12.2
26. Thursday 05/01	Electrodynamics and Relativity	12.3
27. Tuesday 05/06	Electrodynamics and Relativity	12.3