

Spring 2023

PHYS 721 - 002: Electromagnetics II

Andrés Jerez

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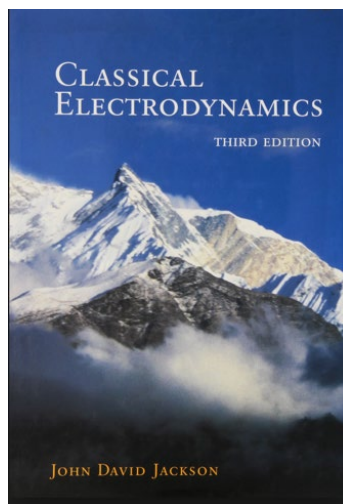
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Instructor: **Andres Jerez:** jerez@njit.edu

Lecture Times: Fridays, 1:00 PM – 3:50 PM, FMH 310

Office hours: Wednesdays, 12:00 PM – 1:00 PM, TIER 455, and by appointment.

TEXTBOOK: *Classical Electrodynamics*, 3rd edition, J. D. Jackson, Wiley, 1999



ELEMENTS OF THE COURSE:

CANVAS: The Learning Management System at NJIT is [Canvas](#) . Lecture notes, quizzes, grades, exams, and additional course material will be managed through Canvas.

EXAMS:

- **Midterm Exam:** There will be an in-class midterm on *Friday, March 10*, covering chapters 7 and 8. The exam will contain six open-ended problems, each worth 10 points for a total score of 60 points. The exam will be administered within Canvas, including the submission. The format is open textbook but closed notes.
- **Final Exam:** A final exam will be given during the final exam period (*Most likely Friday, May 5, 1:00pm to 3:30 pm*), covering chapters 9 – 11. The exam will contain six open-ended problems, each worth 10 points for a total score of 60 point. The exam will be administered within Canvas, including the submission. The format is open textbook but closed notes.

QUIZZES: Starting on January 27, a lecture quiz will be given by the end of every Lecture. The quiz will contain 1 – 5 problems depending on the level of difficulty. The quiz will be graded and discussed in the following lecture. The quizzes will be open textbook but closed notes.

HOMEWORK: No formal homework will be assigned; however, the syllabus lists suggested practice problems that a student should attempt to solve. Problems for the lecture quizzes, midterm, and final exam may be (but do not have to be) selected from the suggested problems.

GRADING: Lecture Quizzes, 40%; Midterm, 30%; Final Exam, 30%.

The cutoff percentages for various letter grades will be in the range of:
85% for A; 80% for B+; 70% for B; 65% for C+; 50% for C; 40% for D; F below 40 %

Final grades are not negotiable: A score of 84.999999% is a B+, not an A.

LAST DAY TO WITHDRAW: April 3rd

HONOR CODE STATEMENT: NJIT has a zero-tolerance policy for cheating of any kind and for student behavior that disrupts learning by others. Violations will be reported to the Dean of Students. The penalties range from a minimum of 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 exam, assignment, quiz, etc. for the course.**

- Statement on 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”

HELP: Contact your instructor if you are having trouble with the course; do not simply hope for a miracle and fall further behind.

LEARNING OUTCOMES:

- Describe electromagnetic radiation using Maxwell equations.
- Analyze the propagation, dispersion, and energy flux of electromagnetic radiation through different types of materials. Assess the changes in direction and polarization of electromagnetic waves as they traverse interfaces between different media. Use this knowledge to describe everyday phenomena such as reflection, refraction, polarized sunglasses, or the bright reflections on the road on a sunny day.
- Evaluate the shape of electromagnetic waves confined to waveguides and resonant cavities.
- Characterize the electromagnetic field due to a localized oscillating source. Recognize the emergence of electromagnetic radiation.
- Sort the contributions to the electromagnetic radiation using the multipole expansion. Analyze the multipolar contributions to the radiation in order to characterize the source of radiation.
- Analyze experimental results using the theory of scattering at long wavelengths. Explain basic properties of the daytime sky (why is it blue, why polarized glasses are effective) using scattering theory.
- Explain Einstein’s two postulates of the Special Theory of Relativity. Perform relativistic transformations of the fields. Recognize the properties of electromagnetic fields that are essentially relativistic. Analyze the motion of relativistic particles in the presence of electromagnetic fields.

Class Calendar

Date	Topic	Reading Material	Suggested Problems
Week 1: 1/20	Review, Plane Electromagnetic Waves	Ch. 6.1- 6.3, 6.7, Ch. 7.1- 7.4	Ch. 7: 2, 4, 6
Week 2: 1/27	Plane Electromagnetic Waves	Ch. 7.5, 7.8, 7.9	Ch. 7: 16, 19
Week 3: 2/03	Ch. 7: Problem Solving	Ch. 7	
Week 4: 2/10	Waveguides	Ch. 8.1-8.4	Ch. 8: 2, 4, 5
Week 5: 2/17	Waveguides	Ch. 8.5, 8.7, 8.8	Ch. 8: 6, 7
Week 6: 2/24	Ch. 8: Problem Solving	Ch. 8	Ch. 8: 3, 4, 5
Week 7: 3/03	Radiation	Ch. 9.1-9.4	Ch. 9: 3, 8
Week 8: 3/10	Radiation/ MIDTERM, Ch. 7, 8	Ch. 9.1-9.4	Ch. 9: 16, 16
	<i>Spring Break</i>		
Week 9: 3/24	Scattering	Ch. 10.1-10.4	Ch. 10: 1, 2, 3
Week 10: 3/31	Scattering	Ch. 10.1-10.4	Ch. 10: 5, 7
Week 11: 4/14	Ch. 10: Problem Solving	Ch. 10	
Week 12: 4/21	Relativity	Ch. 11.1-11.4	Ch. 11: 3, 4
Week 13: 4/28	Relativity	Ch. 11.4-11.8	Ch. 11: 5, 6
Week 14: 5/02	Relativity, Problem Solving	Ch. 11.9-11	Ch. 11: 13, 16
5/05	FINAL EXAM, Ch. 9 - 11		

Spring Break: March 13th to March 18th

Good Friday, April 7th, No Class

Tuesday, May 7th, follows Friday schedule (Last Lecture)

LAST DAY TO WITHDRAW: Monday, April 4th

LAST DAY OF CLASSES: Tuesday, May 2nd

READING DAYS: May 3rd and 4th

FINAL EXAM PERIOD: May 5th – May 11th