

Physics 421 Electricity and Magnetism I
General Information, Spring 2025
January 20, 2025

Subject matter: Electrostatics, magnetostatics, Maxwell's equations, dynamics of charged particles, multipole fields and potential formulation

Instructor: H. Daniel Ou-Yang, professor of physics
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General Plan: The class meets three times per week for 50 minutes each, 10:45 – 11:35 am, Monday, Wednesday, and Friday in **Lewis Lab 511**

Class meetings will be in person.

First date of lecture: Monday, January 20

Note: In cases, when necessary, we will conduct lectures or tests by Zoom using the Zoom link provided at the CourseSite

Textbook:

“*Classical Electrodynamics*,” John David Jackson, 3rd Ed. John Wiley & Sons, 1999.
“*Introduction to Electrodynamics*,” David Griffiths, 4th Ed., 2013

Goals for the course:

The students are expected to learn the physical concept and necessary mathematical tools to solve problems in the following topics:

- 1) Coulomb's law, Gauss's law, E field and electrostatic forces
- 2) Electric potential to determine E field and vice versa
- 3) Laplace equation, Green's theorem and boundary value problems
- 4) Electric field and polarization in polarizable materials
- 5) Biot-Savart law and vector potential of problems of magnetostatics
- 6) Ampere's law and Faraday's laws
- 7) Magnetic field and polarization in magnetic materials
- 8) Maxwell's equations, Lorentz force and conservation of charges
- 9) Potentials, and gauge transformation

Grading:

Homework, short exercises, and class attendance and participation in discussions 20%
Hour Exam I: 20%, Hour Exam II: 20%, Final Exam: 40%

Homework and assigned Exercises: Homework assignments are an important part of the course. Each assignment is due before the lecture that follows the time of the assignment. The objective of the homework assignments is to help you refresh what you have just learned in the class and prepare you about what is to be discussed in the next lectures. Homework assignments will be assigned and submitted through CourseSite. It is important that you submit your assignments on time because I will grade them and give you feedback before the next lecture. By grading them timely, I get a feeling on how well the class as whole are prepared for the next lecture. By giving you feedback, you get to know what you know and what you need to work harder to attain a better understanding of the type of problems you missed.

The homework will be graded based on the effort rather than on the correctness of the answers. Students are encouraged to work with each other on homework assignments. You are also welcomed to email or come to see me if you need help. However, use of solution sets from previous years is considered an act of cheating, both for the current students and for the students who provided the solution sets.

Exams: All exams will be open-book and open notes, including free access to online Course-site materials.

Makeup Exams: No make-up exams for hour test or final exams are given under any circumstance. If an hour exam is missed for a legitimate reason, the corresponding portion of the final exam that covers the same course materials will be counted as the missed exam. It will be an incomplete if a final exam is missed – a make-up exam can be arranged if proof of illness by the University Health Center is provided.

Attendance Policy: Attendance to the lectures is required. Participation in discussions, pop quizzes and in-class exercises are important part of the class attendance.

Office Hours: The instructor will stay after the regular lectures to answer any questions the student might have. Additional office hours can be arranged for small group or individual meetings.

Statement on Academic Integrity/Code of Conduct: This is a graduate class that I assume all graduate students are honest and understand what is expected. However, a couple of specific comments might be necessary.

Homework: I consider homework assignments to be as important for learning as for receiving credits. Discussions with the instructor and/or other students in the class are highly encouraged. However, copying solutions from other students or using of solution sets from previous years are considered an act of cheating.

Exams: Copying from papers of other students, collaborating on exams and using of notes or references that are not explicitly permitted, are obvious forms of cheating that will be dealt with by referral to the Discipline Committee. Phones of any kind are not permitted during the exams.

- **Accommodations for Students with Disabilities**

Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at indss@lehigh.edu, or [online](#).

- **The Principles of Our Equitable Community**

Lehigh University endorses [The Principles of Our Equitable Community](#). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.

- **Lehigh University Policy on Harassment and Non-Discrimination**

Lehigh University upholds the *Principles of Our Equitable Community* and is committed to an educational, working, co-curricular, social, and living environment for faculty, staff, and students. The University does not discriminate in its admissions practices, employment practices, or educational programs or activities on the basis of age, color, disability, ethnicity, familial status, gender expression, gender identity, genetic information, marital status, national origin (including shared ancestry), pregnancy or related conditions, race, religion, sex, sexual orientation, and veteran or military status. Harassment or discrimination is unacceptable behavior and will not be tolerated. The University strongly encourages (and, depending upon the circumstances, may require) students, faculty, or staff who experience or witness harassment or discrimination, or have information about harassment or discrimination in university programs or activities, to immediately report such conduct. If you have questions about Lehigh's [Policy on Harassment and Non-Discrimination](#) or need to report harassment or discrimination, contact the Equal Opportunity Compliance Coordinator (Alumni Memorial Building / 610 758 3535 / eooc@lehigh.edu)

- **Academic Integrity**

All members of the Lehigh community have a responsibility to maintain academic integrity. Resources and details of expectations at Lehigh are available on the [Provost's website](#). It is expected that all students will abide by these standards throughout the course (e.g., homework, quizzes, papers, exams, projects, etc.). Academic integrity case studies will be discussed on the first day of class, and students are encouraged to ask questions for further clarity throughout the semester. Violations of academic integrity standards will not be tolerated and will be handled according to the guidelines in the University's Student Conduct System.