

Physics 515, Spring Quarter 2020

Prof. Leslie J Rosenberg, Department of Physics, University of Washington

General information:

Physics 515, the third course in graduate electrodynamics

Textbook: J.D. Jackson, "Classical Electrodynamics," third edition

Because the campus is closed, the entire course is on-line throughout the quarter. Zoom lectures are Wednesdays & Fridays 11:00-12:20 Pacific time and the first lecture is Wednesday, April 1.

Join the Zoom lectures with the URL <https://washington.zoom.us/j/808790643> (to join, you'll need your UWnetID credentials, then enter the Zoom "SSO" of "washington" or "washington.zoom.edu" depending on your system).

Course Instructor:

Prof. Leslie J Rosenberg

Email: ljrosenberg@phys.washington.edu

Office: Physics & Astronomy Building, room C503

Office Hours Wednesdays 12:30 via Zoom URL <https://washington.zoom.us/j/712804010> or by appointment

Telephone: (206) 221-5856

TAs/graders:

Isaac Shelby ishelby@uw.edu

Michael Pun mpun@uw.edu

Useful Information:

- [Readings, Lectures and Exams](#)
- On-Line Lectures
 - [Phys515-SPR20-lecture_01apr20.pdf](#)
 - [Phys515-SPR20-lecture_03apr20.pdf](#)
 - [Phys515-SPR20-lecture_08apr20.pdf](#)
 - [Phys515-SPR20-lecture_10apr20.pdf](#)
 - [Phys515-SPR20-lecture_15apr20.pdf](#)
 - [Phys515-SPR20-lecture_17apr20.pdf](#)
 - [Phys515-SPR20-lecture_22apr20.pdf](#)
 - [Phys515-SPR20-lecture_24apr20.pdf](#)
 - [Phys515-SPR20-lecture_29apr20.pdf](#)

[Phys515-SPR20-lecture_01may20.pdf](#)
[Phys515-SPR20-lecture_06may20.pdf](#)
[Phys515-SPR20-lecture_08may20.pdf](#)
[Phys515-SPR20-lecture_13may20.pdf](#)
[Phys515-SPR20-lecture_15may20.pdf](#)
[Phys515-SPR20-lecture_20may20.pdf](#)
[Phys515-SPR20-lecture_22may20.pdf](#)
[Phys515-SPR20-lecture_27may20.pdf](#)
[Phys515-SPR20-lecture_29may20.pdf](#)
[Phys515-SPR20-lecture_03jun20.pdf](#)
[Phys515-SPR20-lecture_05jun20.pdf](#)

- Special Lectures

[Potentials and Fields of a charge moving at constant velocity.](#)
[Rutherford scattering: Phil.Mag. vol.21 \(1911\) 672.](#)

- Homework

[Homework 1 \(Due April 10; note special submission instructions\).](#)
[Homework 1 solutions](#)
[Homework 2 \(Due April 17; note special submission instructions\).](#)
[Homework 2 solutions](#)
[Homework 3 \(Due April 24; note special submission instructions\).](#)
[Homework 3 solutions](#)
[Homework 4 \(Due May 1; note special submission instructions\).](#)
[Homework 4 solutions](#)
No homework 5
[Homework 6 \(Due May 15; note special submission instructions\).](#)
[Homework 6 solutions](#)
[Homework 7 \(Due May 22; note special submission instructions\).](#)
[Homework 7 solutions](#)
[Homework 8 \(Due May 29; note special submission instructions\).](#)
[Homework 8 solutions](#)
No homework 9

- Midterm-exam information.

[Take-home mid-term exam.](#)

The midterm is a take-home exam. The exam will be posted here on Friday, May 1, at 3 pm PDT. The exam is open-book; you may refer to Jackson and lecture notes. The exam could include any of the material in lectures, special lectures, homework and the text through section 11.4. The exam is due via email Monday, May 4, at 11 am PDT. Points will be deducted for a late submission.

Email-submission instructions:

1. Scan your solutions as a single PDF file
2. Name your file *midterm-lastname.pdf*
3. Attach your file to an email
4. ... with subject line *midterm-lastname*
5. Send the email to ljrosenberg@phys.washington.edu

Average 73.3, st.deviation 15.9.

- Final-exam information.

[Take-home final exam.](#)

The final is a take-home exam. The exam will be posted here on Friday, June 5, at 3 pm PDT. The exam is open-book; you may refer to Jackson and lecture notes. The exam is targeted to take 1 hour and 50 minutes; that's how long you should spend working on the exam. The exam could include any of the material in lectures, special lectures, homework and the text through chapter 16. The exam is due via email Monday, June 8, at 11 am PDT. Points will be deducted for a late submission.

Email-submission instructions:

1. Scan your solutions as a single PDF file
2. Name your file *final-lastname.pdf*
3. Attach your file to an email
4. ... with subject line *final-lastname*
5. Send the email to ljrosenberg@phys.washington.edu

Average 74.2, st.deviation 24.8.

Recent course news:

- [05Jun2020 15:00] Final-exam posted to this web site.
- [02Jun2020 08:00] Final-exam information posted to this web site.
- [01May2020 15:00] Midterm-exam posted to this web site.
- [29Apr2020 11:15] Midterm-exam information posted to this web site.
- [31Mar2020 11:15] Lecture for 01April2020 will start 11:00 on Zoom from the link <https://washington.zoom.us/j/808790643>
- [31March2020 9:00] The first class day is Wednesday, April 1. Lectures are Wednesdays and Fridays.

Lecture Instructor's Comments

Welcome to Physics 515, the third of a three-quarter sequence of graduate classical electrodynamics. This is a wonderful topic, it's challenging and stimulating. Electrodynamics is crucial for understanding the underpinnings of the physical and biological sciences. It's also crucial for modern technology. In your career, you will need a familiarity with Jackson chapters 1-16 in order to converse sensibly with your colleagues.

Regarding the course: We will use Jackson's text "Classical Electrodynamics". You might want more details or other topics than found in Jackson, or perhaps you'd like an alternative approach. In which case you might want to look at Panofsky and Phillips "Classical Electricity and Magnetism". Two very good, very readable, books for some slightly more formal aspects of the classical field theory with fewer applications are Landau and Lifshitz "The Classical Theory of Fields" and "Electrodynamics of Continuous Media". Another nice thing about Landau and Lifshitz "Fields" is halfway through "Theory of Fields", General Relativity enters rather seamlessly. A slightly more elementary alternate text is Slater and Frank "Electromagnetism". Most homework problems, and indeed the majority of homework problems in most texts, are adapted from Smythe, "Static and Dynamic Electricity", a challenging text with an unusual notation. A more modern text is Zangwell, "Modern Electrodynamics", it has good reviews, but I haven't yet gone through it. There's no perfect text, and every text has gems scattered throughout.

Mathematical methods are interspersed throughout the course as needed, Jackson is good about introducing the mathematics background. For a math refresher, you could refer to Dennerly and Krzywicki "Mathematics for Physicists".

That said, for the first and second quarters we'll follow Jackson's text somewhat closely. The third quarter will be guided by Jackson but the approach will sometimes be different.

Syllabus The syllabus for 515 starts with chapter 8 in Jackson; we'll close out the discussion of cavities with the issue of losses. We'll then follow the text in more or less the text ordering, though we'll supplement Jackson's presentation with added material. See above for a link to the readings and lectures. Try to read the relevant text and added material before class; this will take time but there's a big payoff in understanding.

Grading 40% of your grade is assigned to the midterm exam, 40% to the final exam, 20% to the homework.

- **Midterm exam:** There will be one midterm exam and a final exam. Both are take-home exams. Exams are to be your own work; you are not permitted to collaborate with any other person.
- **Note that there are no make-up exams or make-up homework.** Students with outside professional, service, or career commitments (i.e. military service, professional conference presentation, etc.) conflicting exactly with the exam dates must contact the instructor in the first two weeks of the quarter to establish alternate procedures. Students who miss an exam or homework due to illness should contact the instructor as soon as you're reasonably able to discuss alternate procedures. Except for debilitating illness or other crisis, students who miss an exam or homework without making prior arrangements with the lecture instructor will get a zero for that score. Except for illness and circumstances noted above, a final grade of 0.0 may be assigned to any student who misses a midterm or final exam.
- **Homework:**
Lecture homework will generally be assigned and collected weekly. We're still working out the system for submitting and returning homework. The graders will consider neatness and logic of presentation, points will be deducted for lack of either. Words help in explaining your solution. Briefly, if your homework is a messy, incoherent scrawl, the graders won't evaluate your homework. I strongly encourage you to work collaboratively, but your submitted work must be your own.
- **Communication:**
For administrative issues, it's best to contact me via email. But, for physics questions, please don't use email (unless the question answer is of the "yes/no" variety). Physics is best discussed at Zoom office hours. Also, don't hesitate to make a Zoom appointment to talk with me.
- **Religious Accommodations:**
Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (<https://registrar.washington.edu/students/religious-accommodations-request/>).