PHYS 610; Mathematical Methods; Fall 2022

PHYS 622; Electromagnetism; Winter 2023

This page and its links contain all of the general information you need for the course, and they will be updated frequently. Please check this page regularly, and make sure you hit your browser's 'Reload' button so you get the latest version.

Overview, and Expected Learning Outcome

PHYS 610 is designed to teach mathematical concepts and methods that are useful in physics in general, and in the theory of classical electromagnetism in particular. Successful completion of the first quarter will result in knowledge of simple algebraic structures that frequently appear in physics, and of basic concepts and methods in analysis. PHYS 622 covers basic notions and simple applications of classical electrodynamics. Successful completion of the second quarter will result in knowledge of Maxwell's equations as well as their static and simple dynamic solutions.

The two quarters will be taught as one contiguous course; if you contemplate taking 622 without having taken 610 please talk to me first.

Time and Location:

- TH 13:00 - 14:50 in 318 WIL
- Speaking of time, here is the official time from NIST

Lecture Notes :

- The table of contents for 610 may be updated as the course proceeds. The links are to a (not quite up to date) scanned version of my handwritten notes that you may find hard to read. I will write everything I say on the board, so if you take good notes then by the end of the term you'll have your own set of my lecture notes. Typeset notes for the first part of 610 are here. These notes are still a work in progress and will be updated as we go along.

- The tentative table of contents for 622 is here, with links to a version of my handwritten notes. Typeset notes for an earlier version of the course are here.

- Please keep in mind that anybody else's lecture notes, including the lecturer's, are next to useless unless you have your own set taken by YOU. This goes for textbooks as well. My notes are only meant as a record of my blackboard art to check against.

Instructor:

- Dietrich Belitz
- email: dbelitz@uoregon.edu
- phone: upon request
office: 459 Willamette

office hours:
  - real: I'll try to keep an open office policy. Catch me after class if possible; otherwise, just stop by my office. If I'm really busy I'll kick you out, but usually I'll be able to accommodate you if I'm in. If your schedule and mine turn out to never overlap, send email and make an appointment.
  - virtual: Anytime. My e-mail response time is rarely longer than a few hours, and usually it is much shorter. If desirable, we can set up a zoom session.

TA:

- Peter Zheng
- office: 250 WIL
- email: pzheng@you-know-where
- office hours: W 3-4pm

Textbooks and other helpful material:

- Recommended texts:

  These are books that I used heavily in preparing the lecture notes. They are NOT required, and my lectures are designed to be self-contained. They all are excellent reference texts, but make sure you really like a book before you buy it. If you find some other books more useful for background reading or reference, by all means use those.

Recommended books for 610:
  - M.J. Lighthill, *Introduction to Fourier Analysis and Generalized Functions*

Recommended books for 622:
  - J. Schwinger et al, *Classical Electrodynamics*

- Other useful books:
  - C.M. Bender and S.A. Orszag, *Advanced Mathematical Methods for Scientists and Engineers*
  - R. Courant and D. Hilbert, *Methods of Mathematical Physics*
  - P. Dennery and A. Krzywicki, *Mathematics for Physicists*
  - L.E. Elsgole, *Calculus of Variations*
  - J.D. Jackson, *Classical Electrodynamics*
  - F.E. Low, *Classical Field Theory*
  - P.M. Morse and H. Feshbach, *Methods of Theoretical Physics*
  - F.W.J. Olver et al, *NIST Handbook of Mathematical Functions*
  - D.E Soper, *Classical Field Theory*

Exams and Grading

Midterm 610: The *610 Midterm Exam*, 10/20/2022, due 11/03/2022, is a takehome exam that runs concurrently with homework assignments 4 and 5.
Final 610: The Final for 610 is a limited-time take-home exam that is due on Tuesday, Dec. 6, 2:30pm. Please read the instructions first. Once you are ready, you will find the exam here.

Midterm 622: tba
Final 622: tba

Homework will count for 20% of the grade. Your grade will thus be mostly based on the exams, but it will be next to impossible to do well on the exams unless you have spent a lot of time and effort on the homework problems. If your performance on the final is better than on the midterm, the midterm will not count and the final will count 80%. If your performance on the midterm is better than on the final, the midterm will count for 30% of the grade and the final for 50%.

**Homework:**

Homework problems will be posted on this page in pdf format (see below). They will be assigned weekly on Thursday and will be due the following Thursday in class. I will post scans of my solutions, also in pdf format.

Don't be fooled by the 20% weight given to the homework. The homework problems are an integral part of the course, and spending substantial time on the homework will be essential for understanding the material discussed in class. One can learn very little physics by just reading a book, or listening to lectures, so make sure you allow adequate time for doing the homework problems. Also, doing well on the exam will be next to impossible without a thorough understanding of the homework problems.

Note: Of course I know that the solutions to most of my homework problems can be found on the web. Find and look at them at your own peril.

Collaborating on the homework is okay, and even encouraged. You should make sure, however, that you really understand the material yourself rather than just tagging along.

---

**Problem Sets for PHYS 610**

- [Problem Assignment #1](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A1.pdf): 09/29/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A1.pdf)
- [Problem Assignment #2](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A2.pdf): 10/06/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A2.pdf)
- [Problem Assignment #3](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A3.pdf): 10/13/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A3.pdf)
- [Problem Assignment #4](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A4.pdf): 10/20/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A4.pdf)
- [Problem Assignment #5](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A5.pdf): 10/27/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A5.pdf)
- [Problem Assignment #6](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A6.pdf): 11/03/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A6.pdf)
- [Problem Assignment #7](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A7.pdf): 11/10/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A7.pdf)
- [Problem Assignment #8](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A8.pdf): 11/17/2022, past due, [Solutions](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Solution_A8.pdf)
- [Problem Assignment #9](https://pages.uoregon.edu/dbelitz/teaching/2022_23/PHYS_610/Problem_A9.pdf): 11/24/2022, due 12/01/2022

**Problem Sets for PHYS 622**

last update 12/02/2022

*Dietrich Belitz*
*Department of Physics*
*University of Oregon*
*Eugene, OR 97403*
*USA*

dbelitz@uoregon.edu