

# Physics 420

## *Electricity and Magnetism*

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Winter Term, 2016  
8:00 MWF, Kroehler 214

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**Course Description:** This course will focus on electrostatics and magnetostatics, ultimately arriving at Maxwell's integration of these two ideas into electromagnetism. Electrodynamics is by no means a closed subject, but has foundational principles which have stood the test of time and scrutiny. The complete formulation of the laws of classical electricity and magnetism culminates in the prediction of electromagnetic waves, perhaps the greatest triumph of 19<sup>th</sup> century physics. Incidentally, this is the first physical theory to satisfy the requirements of special relativity and was the theory that led Einstein to his postulates. In this course we'll develop these principles and use them to attempt to explain (and predict) certain physical processes while taking brief trips into contemporary topics. As we'll see, E & M requires us to develop a high degree of mathematical sophistication as well as a deep conceptual foundation in order to truly gain an understanding of this topic. We will also work to integrate computation into this course in appropriate ways.

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*Text:* **Introduction to Electrodynamics**, 4<sup>th</sup> ed. David J. Griffiths (Addison-Wesley, 2012). ISBN-13: 978-0321856562; ISBN-10: 0321856562

*"To those who do not know mathematics it is difficult to get across a real feeling as to the beauty, the deepest beauty, of nature... If you want to learn about nature, to appreciate nature, it is necessary to understand the language that she speaks in."*

—Richard Feynman (*The Character of Physical Law* (1965) Ch. 2)

*Other Texts:*

- **Classical Electrodynamics**, John David Jackson
- **The Feynman Lectures on Physics, Volume II**, R. Feynman, R. Leighton, M. Sands.

### **Course Elements**

- **Problems** are assigned regularly throughout the term and due dates will be provided. Problems should be neatly written with complete solutions and explanations of your work. Generally, you should outline your approach at the beginning of the solution and offer interpretation and or observations concerning the result of the calculation. Students are encouraged to collaborate, however, each student's solution must be his or her own.

The problems will facilitate your learning in this course and need to be done in a timely fashion. In order to incentivize prompt completion of problem sets I reserve the right to penalize for late assignments.

- There will be **two midterm exams** and a **comprehensive final exam** during the course. You will be expected to complete the exams on your own. Details of the format and coverage will be provided during the course.
- You will be required to **present three problem solutions** in class. These will be a short presentation but effective one of your solution to an assigned problem. Presentations should be rehearsed and solutions should be checked with the instructor prior to class. Grades will be based on the effectiveness of the presentation style as well as the quality, completeness and correctness of the solution. Presentation media can (and often should!) be used but must be effective.
- **Participation and attendance** during class is mandatory. While class won't provide everything you need for the course, it's a time for discussion and development of key ideas. Please show up on time. We're a small course and it's a distraction when students don't show up or show up late. Because I feel so strongly that attendance facilitates learning I've given you the opportunity to enhance your grade by simply being in class and asking good questions. Of course, the reverse of that last statement logically follows.

#### *Grading Policy:*

You will earn a grade in this class based on the following weightings:

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|-----------------------------------|-----|
| • Problem Sets                    | 30% |
| • Midterms                        | 25% |
| • Final                           | 25% |
| • Problem Presentation(s)         | 10% |
| • Prompt Attendance/Participation | 10% |

#### *Office Hours (Tentative):*

My schedule for the term is posted outside my office door and is subject to change. I'll make a point to be in my office during the following periods with the expressed purpose of discussing physics related questions:

- Monday, 9:30am-12pm
- Tuesday, 8am-10am
- Wednesday, 1pm-3pm
- Thursday, 2pm-4pm
- Friday, 9:30am-12pm

*Look at my schedule- I have additional flexible time that I'm happy to meet with you to talk physics. Office hours are first come first serve, but other times can be arranged by appointment.*

**Honor Code**

Each student is expected to present his or her own work; however, you are encouraged to work together on the assignments. You should write up your own assignments, but working with classmates to solve problems can be a valuable learning aid. Two ground rules. First, working together is most effective if all individuals contribute more or less equally to the group effort. You should be very wary if you are always on the giving or the receiving end in such effort. Second, when you receive significant assistance through conversation with a colleague, I ask you to follow common scientific courtesy and acknowledge that help briefly in your submitted work.