

# PHYSICS 2610

## Introductory Physics III: Electromagnetism

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<b>Teaching Assistant</b>	Chung Ting (Marco) Ma. 057 Physics. 4-3926. <a href="mailto:ctm7sf@virginia.edu">ctm7sf@virginia.edu</a> Office hours TR TBD
<b>Class times</b>	Lectures: MWF 12:-12:50. 204 Physics Problem sessions: W 2:00-2:50. 218 Physics (first section) R 3:00-3:50. 305 Chemistry (second section)

### Course description

How and why does lightning strike? What are northern lights? Solar flares? Why could the latter fry all electronics on Earth? Speaking of which, how does the power grid work? And what is light, anyway? These questions all have to do with electricity, magnetism, and electromagnetism in general, and a great many of them will be demonstrated in our classroom!

You will build on the physics knowledge you acquired in Mechanics (prerequisites 1620 or 1425) to investigate new physical forces, the Coulomb and Lorentz forces. Another paradigm will shift on you: until now, classical mechanics has been all particles (and some fluids, which are all but gooey particles) but this semester you will discover that there are other, more immaterial, types of physical objects that stand on their own: fields and waves. Finally, four new laws of physics, the four Maxwell equations, will be unveiled in this course. You will study spectacular manifestations of electromagnetism in nature and the universe and you will apply your freshly gained knowledge of electromagnetism to understand how real devices work, such as electric toothbrushes and their charger, metal detectors, the power grid, and radio and wi-fi. Finally you will get to ponder electromagnetism and the nature of light, the most fundamental question in all of physics until Planck and Einstein at the beginning of the XXth century.

As part of the physics major track, this course is intended for you to build a strong conceptual foundation for advanced topics,<sup>1</sup> to understand technology from first principles, and to get opportunities to experience, and experiment with, your personal thought process throughout a discovery.

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<sup>1</sup>such as quantum physics, in which everything is both wave and particle!...

# Syllabus

## ELECTRICITY

- Chap. 21. Electric charge and electric field
- Chap. 22. Gauss' law
- Chap. 23. Electric potential
- Chap. 24. Capacitance, dielectrics, electric energy storage
- Chap. 25. Electric currents and resistance
- Chap. 26. DC circuits

## MAGNETISM

- Chap. 27. Magnetism
- Chap. 28. Sources of magnetic field
- Chap. 29. Electromagnetic induction and Faraday's law
- Chap. 30. Inductance, electromagnetic oscillations, and AC circuits

## ELECTROMAGNETISM

- Chap. 31. Maxwell's equations and electromagnetic waves

**Corequisite** MATH 2310 Calculus III

**Exam schedule** Midterm #1: Friday, Wednesday 24, 2014. 12:00-12:50. 204 Physics  
Midterm #2: Wednesday, October 29, 2014. 12:00-12:50. 204 Physics  
Final: Saturday, December 13, 2014, 2 pm - 5 pm. 204 Physics  
Homework: once per week. NO LATE HOMEWORK

**Grading**

Homework	35 %
Problem session quizzes	5 %
Clicking in class	5 %
Midterm exams	20 %
Final exam	35 %

**Text (required)** Giancoli, *Physics for Scientists and Engineers*, 4th Ed., Vol.1, Prentice-Hall

**Online tutorial (required)** *Mastering Physics* (web-based tool invented at MIT)  
The whole package is available at the UVa bookstore.  
**Note:** when registering, use your UVa email handle as ID  
**Note:** the course ID is PHYS2610FALL2014

**Voting remote (required)** *iClicker2*

**Library reserve** Many books and the solutions binder can be found on the "Physics 2610" reserve shelf at the Physics Library.

## Course Policies and Guidelines

- Phys 2610 is **calculus-based** and therefore exceeds the premed requirements (Phys 2010/20 aren't calculus-based). You should take this course (or Phys 2415) if you are interested in majoring in Physics or if it is explicitly required by your major, e.g., astronomy, environmental sciences.
- **The course's web site** (grades, info, teaching evaluations) should be on your UVa Collab account. If it doesn't appear there, let me know.
- **Homework policy:** LATE HOMEWORK IS NOT ACCEPTED. The lowest homework score will be dropped for all students who fill in the course evaluation at the end of the semester.
- **Attendance** is not taken at lectures or problem sessions. However, students are responsible for all material taught and all announcements made therein. Graded quizzes may be given at problem sessions.
- **Office hours are mandatory once**, at the beginning of the semester: I want to meet everyone in the class at least once! Everybody in the class will have to schedule an appointment with me in the first two weeks.
- **Cell phone policy:** All cell phones must be silenced before entering the classroom and be unused until the end of lecture, problem sessions, and exams, unless an emergency occurs.
- **Problem sessions** are designed to help you practice the course material using exercises and short problems, so as to prepare you for homework and exam problems. In addition, we will cover more advanced topics from time to time, going beyond the textbook. Note that **some of the problems that were treated extensively during the problem sessions can constitute exam material.**
- **Class Honor ("pledge") Policy Statement:** I trust every student in this course to fully comply with all of the provisions of the UVa honor system. In addition to pledging that you have neither received nor given aid while taking your exams, your signature also affirms that you have not accessed any notes, study outlines, problem sets, old exams, answer keys, or the textbook, while taking a closed-book exam. Alleged honor violations brought to my attention may be forwarded to the Honor Committee. If, in my judgment, it is beyond a reasonable doubt that a student has committed an honor violation with regard to an exam, that student will receive an immediate grade of 'F' for that exam, irrespective of any subsequent action taken by the Honor Committee.