

Class Meeting: **M, W & F** 10:10-11:30am

Class Location: Heg 201

Office Hours: **F** 3-5pm

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Course Description — The idea of a field, a physical entity that permeates all of space, completely changed physics. It is the foundation for making physics local—even far separated objects like charges can be in direct touch with an electric or magnetic field that spreads between them. The field can be a propagator of causes from one charge to another, thus the field undergirds causality. Fields can naturally support the waves generated by moving charges. Much of modern physics has flowed out of the notion of a field.

Electromagnetism was discovered first amongst the physical field theories. Its remarkable unification of the effects of electricity and of magnetism is a crowning achievement in physics and serves as motivation and model for all our subsequent efforts to unify. Through our study of electromagnetism we will develop increasingly sophisticated mathematical and theoretical techniques that will serve you well in all of your physics studies. In particular, after this course you will be in a better position to understand modern approaches to particle physics and general relativity.

Text: *Introduction to Electrodynamics 4th ed.*, by D. J. Griffiths (Cambridge Univ. Press, 2017)

Homework — There will be homework due every Friday at 5:30pm and homework corrections due every Monday by 6pm. The goal of the homework is for us to engage each other in a discussion of physics regularly, please come and visit as often as you like to chat. Along these lines, I recommend that you work together; this is invaluable in learning physics. Please write things up yourself to show me *and you* that you understand it (this helps battle the illusion of explanatory depth, or [knowledge illusion](#)). Please do not use the internet as a resource for anything but definitions of terms; if ever you are in doubt about the appropriateness of a resource, just ask me.

Take home — Twice during the semester I will give you take home exams. These will be 4 hour, open note, self-timed exams. You can study as much as you like using any resource up to opening the exam. However, once you have opened the exam I ask that you only refer to your class notes. I ask that you honor your peers and the effort that we all put into the class by not going over time or referencing any outside materials. I will also give you one in-class exam, which will help you to practice this common format.

Grading Structure

Weekly Homework (due on Mondays)	30%
Guest lecture	5%
Attendance	5%
Take home exam	20%
In-class exam	20%
Take home final	20%

Corrections — I will get graded work back to you as quickly as possible. I will post solutions to the homework promptly when the homework is due. This will allow you to correct the problems yourself using the [homework corrections guide](#). Then resubmit your corrected homework by the following Monday at 5:30pm. I will correct 2 problems from the initial submission and 2 from the resubmitted version. Initially graded problems can also be regraded problems. Because of this regrade policy I cannot accept late work.

Course website: faculty.bard.edu/hhaggard/teaching/phys312Fa19/

Week	Topics	Chap.
9/2	Vector Analysis	1
9/9	Electric Fields, Electric Potential, Work & Energy in Electrostatics	2
9/16	Conductors. Laplace's Eq, Method of Images, Separation of Variables	2 & 3
9/23	The Multipole Expansion. Lorentz Force Law & Biot-Savart Law	3 & 5
9/30	Div and Curl of B, Magnetic Vector Potential	5
10/7	Electromotive Force Take home due 10/11	7
10/14	Fall Break 10/14-10/15 Electromagnetic Induction	7 & 9
10/21	Maxwell's Eqs & Electromagnetic Waves	9
10/28	Conservation Laws, Potentials & Fields	8 & 10
11/4	Potential of Point Charges & Polarization In-class Exam	10 & 4
11/11	Electric fields in Matter	4
11/18	Magnetic Fields in Matter: Magnetization and Magnets	6
11/25	H, linear, and non-linear media Thanksgiving 11/28-12/1	6
12/2	Conservation Laws Again	8
12/9	Maxwell's Eqs in Matter, EM Waves in Matter Advising Day 12/11	7 & 9
12/16	Completion days. 12/20 Last day classes Exam 3 12/16-17	

Note: I reserve the right to adjust this syllabus during the semester

I have read over this syllabus. I agree not to look at solutions manuals or use the internet for anything other than looking up reference information. Finally, I commit to stick to the parameters of the take home exams.

Signed:

Date: