

Class Meeting: **M, W & Th** 10:20-11:40am  
 Class Location: Heg 106  
 Office Hours: Tu 3:25-4, W 3:30-5, Th 4:30-5:30

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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 week. 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.

**Homework Feedback** — In the spirit of promoting discussion, I would like to go through and score homework together in small group or individual meetings. I believe that most of you have done this with me before. Let's discuss this option together on the first day of class and finalize how we will proceed with it.

**Exams** — To give you practice with a variety of exam structures and give you a diverse set of methodologies to display your skills we will have three different exam structures: oral, in-class, and a take-home final. The take-home exam will be a 4 hour, open note, self-timed exam. 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 at midnight W)	35%
Guest lecture	10%
Oral exam	15%
In-class exam	20%
Take home final	20%

**Course website:** [faculty.bard.edu/hhaggard/teaching/phys312Sp21/](http://faculty.bard.edu/hhaggard/teaching/phys312Sp21/)

Week	Topics	Chap.
2/1	Vector Analysis	1
2/8	Vector Calculus & Delta Functions	1
2/15	Electric Fields & Electric Potential.	1 & 2
2/22	Work & Energy in Electrostatics, Conductors	2
3/1	Laplace's Eq, Method of Images <span style="border: 1px solid black; padding: 2px;"><b>Oral Exam Week</b></span>	2
3/8	<b>3/8&amp;11 Respite Days</b> Separation of Variables	3
3/15	The Multipole Expansion, Lorentz Force Law	3 & 5
3/22	<b>3/24 Respite Day</b> Biot-Savart Law, Div and Curl of B	5
3/29	Magnetic Vector Potential, Polarization	5 & 4
4/5	Field of a Polarized Object <span style="border: 1px solid black; padding: 2px;"><b>In-class Exam</b></span>	4
4/12	Electric Displacement, Linear Dielectrics	4
4/19	Linear Dielectrics, Magnetization	4 & 6
4/26	Magnetized Objects, Auxiliary Field H	6
5/3	<b>Advising Days 5/3&amp;4</b> Nonlinear Media	6 & 7
5/10	Maxwell's Eqs & Electromagnetic Waves	7
5/17	<b>5/19-25 Completion days.</b> <span style="border: 1px solid black; padding: 2px;"><b>Exam 3 : due 5/25</b></span>	

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

**Calling In & The Honor Principle** — Check out the work of [Loretta Ross](#).

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 all of the exams.

Signed:

Date: