



Phys 345 Electromagnetics

MWF, 11:30am, Collins 201
Fall 2018



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<http://willamette.edu/~jjrembold/classes/wu339>

Collins 311

Goudy Hours: M–Th 1-2: I'll be eating but happy to help or chat!

Office Hours: MWTh 2-5, or if the door is open! (so pretty much always...)

Phone: (503) 370-6860

This syllabus is subject to change or adaptation as the semester progresses. (Particularly the schedule...)

Course Description: The intent of this course is to extend beyond a second semester introductory physics course to further explore the concepts of electricity and magnetism. Particular attention will be paid to using vector calculus to approach and solve for the static and dynamic properties of electromagnetic fields. Topics will include cases of static charge distributions (electrostatics), constant current distributions (magnetostatics), electromagnetic properties in matter and Maxwell's equations. Use numerical methods and computers for modeling and visualizing data will also be covered and practiced.

Prerequisite(s): Phys 222 and Math 249

Note: A minimum grade of C- is required for this course to count toward university credit.

Credits: 1.0

Text: *Introduction to Electromagnetism* (4th Ed.)

Author: David J. Griffiths

ISBN-13: 978-9332550441

Note: No need to overpay for this! The above ISBN is for the paperback for \$20. You can also get older versions for even cheaper or look for pdfs online!

Course Objectives:

Over the semester, students will gain a working knowledge in:

1. Using vector calculus to interpret and calculate fields in three dimensions
2. Solving for electric and magnetic fields due to various electro or magneto static source distributions
3. Discerning and computing behavioral differences in fields in vacuum vs fields in matter
4. Applications and computation of Maxwell's Equations
5. Using computers to aid in solving, visualizing, and checking solutions

Moreover, physics is a field that requires intense problem solving. By the end of the semester students will have further honed various methods of problem solving and practiced using different computational tools to assist them.

Grade Distribution:

Homework	45%
Exam 1	15%
Exam 2	15%
Final Exam	25%

Letter Grade Distribution:

≥ 92.00	A	72.00 - 77.99	C
90.00 - 91.99	A-	70.00 - 71.99	C-
88.00 - 89.99	B+	68.00 - 69.99	D+
82.00 - 87.99	B	62.00 - 67.99	D
80.00 - 81.99	B-	60.00 - 61.99	D-
78.00 - 79.99	C+	≤ 59.99	F

Student Learning Objectives (SLO):

- To be able to translate from physical descriptions to mathematical formulations and back again. Vector calculus can feel abstract but is firmly grounded in reality. Students should be able to move smoothly back and forth between physical and mathematical interpretations of a problem.
- To be able to select and apply proper problem-solving techniques and strategies for a novel problems they have not seen before. Pro and cons and implicit assumptions of various strategies should be considered when approaching a novel problem. Students should feel comfortable choosing a technique, justifying said technique, and correctly using that technique.
- To use visuals or approximations to check the validity and reasonableness of their solutions. Everyone makes mistakes or tries a technique that might not work. It is incredibly important to be able to step back and evaluate a solution by several means to decide if it actually makes sense.
- To communicate their solution and problem-solving methods clearly through speech, text, and visualizations. The best problem-solving techniques amount to nothing if the process and solution can not be clearly described, explained and justified.
- To accept responsibility for their own learning. Students need to evaluate what they do and don't understand about a topic and ask detailed questions to better articulate where they are struggling.

Course Assessment:

- **Homework**

- Written: Homework will be assigned each week and will be due at midnight each Monday. Homework will be problems of my own devising and will generally have about 5-6 problems per assignment. Homework must be written up nicely and legibly, with different problems starting on new pages. Feel free to use scratch paper if you are worried about the trees. This class is largely homework based, so please ensure that you are keeping up and turning in the problem sets! I will randomly grade 2-3 problems from each assignment. While I'd love to give you feedback on every single problem I can not physically grade so many problems per week! I will keep a copy of the solutions in my office that you can check your other solutions against if you want to ensure you are completing the non-graded problems correctly.
- General Info: Physics is a problem solving discipline, and the best method to gain proficiency is solving problems. There are no real "shortcuts". The number and length of problems assigned is my best estimate for having you adequately practice and learn the material without being an excessive burden on your time. Working in groups and helping others is very encouraged, though students should turn in their own work. I highly recommend helping and instructing other classmates if you feel proficient on a topic, both to help them and because there is no better way to identify gaps in your own knowledge than when you attempt to teach something.

- **Tests**

- There will be three tests spaced throughout the semester: 2 midterms and a final. Test format may either be in-class, take-home, or a combination of the two. In-class tests will allow you to bring in a sheet of notes to assist you, while take-home tests will be open-book, open-note, and open-computer. We'll talk about what form each test will take in the weeks leading up to each test.

- **Attendance**

- While attendance will not be graded in this class, I heartily encourage you to show up. I work hard to attempt to make the lecture hour useful, engaging, and fun, and would much prefer feedback if I'm not meeting your needs rather than you vanishing from the classroom. Much of class will be group work on various example problems followed by discussion. Bringing an internet-ready device will help with question responses so we can get a feel for where the class is at.

- **Extra Credit**

- While there may occasionally be a problem on a homework assignment that is deemed extra credit, other opportunities for extra credit in this class will be strictly limited. A new source of extra credit that I'll be trying out this semester is through the Campuswire class forums reputation system. If you are at the max reputation level at the end of the semester (earned through helping others with questions and asking popular questions yourself) then you'll get a full 1% added to your grade. Lower tiers of reputation will scale accordingly.

Course Policies:

Late Work Policy

I understand that sometimes things come up and you are unable to get an assignment in on time, and I strive to be incredibly flexible and accepting of late work. However, there also comes a point when you get too far behind to realistically keep up with the class. In an effort to compromise between the two, my late policy allots you 14 cumulative days of late work throughout the entire semester. So you can turn 14 assignments in one day late, 2 assignments in a week late, etc. without penalty. Once you have used up your 14 days, any further late assignments will immediately be worth only 50% of their total possible points.

Incomplete Policy

An incomplete grade will only be granted in the case of prolonged illness or family emergencies that remove the student from the campus for an extended time period during the semester. Under no situations will an incomplete be granted due to a student falling behind through lack of motivation, understanding, or time management skills. If you are concerned about your progress and how you are doing in the class, please come visit me! We can sort out where you are struggling and work out a plan to get you back on track.

Willamette Policies:

Academic Honesty

Cheating is defined as any form of intellectual dishonesty or misrepresentation of one's knowledge. Plagiarism, a form of cheating, consists of intentionally or unintentionally representing someone else's work as one's own. Integrity is of prime importance in a college setting, and thus cheating, plagiarism, theft, or assisting another to perform any of the previously listed acts is strictly prohibited. An instructor may impose penalties for plagiarism or cheating ranging from a grade reduction on an assignment or exam to failing the course. An instructor can also involve the Office of the Dean of the College of Liberal Arts for further action. For further information, visit: http://www.willamette.edu/cla/catalog/resources/policies/plagiarism_cheating.php.

Time Commitments

Willamette's Credit Hour Policy holds that for every hour of class time there is an expectation of 2-3 hours work outside of class. Thus, for a class meeting three days a week you should anticipate spending 6-9 hours outside of class engaged in course-related activities. Examples include study time, reading and homework, assignments, research projects, and group work.

Special Accommodations

Please tell me about any special accommodations that will affect your participation in this course within the first two weeks of class. I will respect any accommodations authorized by the Office of Disabilities Services.

Tentative Course Outline:

The weekly coverage might change as it depends on the progress of the class. However, I highly recommend you follow along with the reading, as it makes a large difference!

Week	Date	Reading	Description	Deadlines
1	Aug 27	Ch 1	Vector Analysis	
	Aug 29	Ch 1	.	
	Aug 31	Ch 1	.	
2	Sep 3		Labor Day (No Class!)	HW1 Due
	Sep 5	Ch 2	Electrostatics	
	Sep 7	Ch 2	.	
3	Sep 10	Ch 2	.	HW2 Due
	Sep 12	Ch 2	.	
	Sep 14	Ch 2	.	
4	Sep 17	Ch 2	.	HW3 Due
	Sep 19	Ch 2	.	
	Sep 21	Ch 2	.	
5	Sep 24	Ch 3	Potentials	HW4 Due
	Sep 26	Ch 3	.	
	Sep 28	Ch 3	.	
6	Oct 1	Ch 3	.	HW5 Due
	Oct 3	Ch 3	.	
	Oct 5	Ch 3	.	
7	Oct 8	Ch 4	Electric Fields in Matter	HW6 Due
	Oct 10	Ch 4	.	
	Oct 12		Exam 1 (Ch 1-3)	
8	Oct 15	Ch 4	.	
	Oct 17	Ch 4	.	
	Oct 19		Mid-Semester Day (No Class!)	
9	Oct 22	Ch 4	.	HW7 Due
	Oct 24	Ch 5	Magnetostatics	
	Oct 26	Ch 5	.	
10	Oct 29	Ch 5	.	HW8 Due
	Oct 31	Ch 5	.	
	Nov 2	Ch 5	.	
11	Nov 5	Ch 6	Magnetic Fields in Matter	HW9 Due
	Nov 7	Ch 6	.	
	Nov 9		Exam 2 (Ch 4-5)	
12	Nov 12	Ch 6	.	HW10 Due
	Nov 14	Ch 6	.	
	Nov 16	Ch 6	.	
13	Nov 19		Thanksgiving Break!	
	Nov 21			
	Nov 23			
14	Nov 26	Ch 7	Electrodynamics	HW11 Due
	Nov 28	Ch 7	.	
	Nov 30	Ch 7	.	
15	Dec 3	Ch 7	.	HW12 Due
	Dec 5	Ch 7	.	
	Dec 7	Ch 7	.	
Dec 14			Final	