

1 Course Information

Instructor

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Office Hours TR 10:15 am-Noon

and by appointment

Teaching Assistant

Henry Kuhlman

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Office Hours: TR 2-4:00 pm

DEH-332

Prerequisites

MATH 3113 - Differential Equations

Math 2934/2443 - Vector Calculus

ECE 2723 - Circuits I

Course Website

<http://learn.ou.edu>

Class Times

TR 9-10:15 am

Textbook

Required:

Field and Wave Electromagnetics

Cheng 2nd ed.

A Student's Guide to Maxwell's Equations

Fleisch

Supplementary:

Schaum's Outlines: Electromagnetics

Edminster

Div, Grad, Curl and All That

H.M. Schey

Class Format

This class will not be pure lecture. There will be class discussion and activities. Participation is expected and will be rewarded.

2 Course Objectives

At the end of this course, the successful student will be able to:

- Use Maxwell's Equations to analyze and apply the fundamental physics defining the operation of vital components in electrical engineering such as capacitors, inductors, electric motors, generators, and antennas.
- Look at a structure, and draw the electromagnetic fields, due to an intuitive knowledge of the physics described by Maxwell's Equations.
- Implement the use of these components in systems in future courses to solve open-ended problems due to the acquisition of this fundamental knowledge.
- Determine best designed versions of these components based upon this fundamental knowledge.
- Design better versions of these components in future courses based upon this fundamental knowledge.

3 Class Policies

1. Maintain collegial atmosphere in classroom

- Participate in discussion
- Be respectful of other students
- Put cell phones on silent
- Do not use cell phones or laptops in class except during specified response times
- Ask questions

- Let me know when you are lost
2. Class preparation
 - Come prepared to class. Complete the assigned readings before class. It will not only help you to understand the material better, but will help you to obtain participation points.
 3. Contact with the instructor
 - E-mail is the best way to contact me for a quick question
 - For long questions please come to office hours
 - If you can't come to office hours e-mail me for an appointment. Unless otherwise notified, appointments will be at my office in the Radar Innovations Laboratory.
 4. Extra Credit
 - No individual extra credit will be given in this course. This means there will be no extra credit available to only certain students. If there is extra credit, it will be announced by me, to the entire class. So don't ask for extra credit for you, and you alone. I have fundamental pedagogical and philosophical issues with individual extra credit.
 - There will be class trips for which extra credit can be obtained through completion of an essay. The first such class trip is the ARRC Undergraduate Research Seminar for which information is given in an attached handout.
 - Extra credit on exams is available through class participation.
 5. Attendance
 - Class attendance is expected
 - Make every attempt to be on-time to class. Class participation will be required to get extra credit during class.
 - If late to class please try to minimize the distraction that you create
 6. Academic Integrity
 - It is your responsibility to read and understand the Academic Integrity Policy (<http://www.ou.edu/provost/integrity/>).
 - Plagiarism and copying will not be tolerated. If caught, all parties involved will receive a zero for the assignment. If caught multiple times, then the repeat offenders will receive a failing grade for the course. There will potentially be multiple reports due for this course, please educate yourself on the proper use of citations and what constitutes plagiarism.
 7. Reasonable Accommodation
 - Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.
 8. Late Assignments
 - No late assignments will be accepted for this course.

- If you will not be in town when an assignment is due, either give the assignment to another student to turn in for you, or turn in the assignment before you leave town.

9. Religious Holidays

- It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays.

4 Assignments

4.1 Grading

<i>Vector Calculus Pretest</i>	5%
<i>Homework</i>	25%
<i>Midterm Exam I</i>	20%
<i>Midterm Exam II</i>	20%
<i>Final Exam</i>	30%

The grading scheme will be as below:

90-100	A
80-89	B
70-79	C
60-69	D
59 and below	F

4.2 Homework

Homework will be assigned weekly (due every Thursday). Minimal solutions will be posted with the homework. However, the homework should be turned in with a specific format beyond these solutions. To get full credit for the homework, you should present your homework in a three column format. The first column should be the mathematical step, the second column should be the mathematical step in words, and the third column should explain why that mathematical step is necessary. No solution in this format will ever be posted. If you have questions on the homework, please ask the TA or me. Grading for the homework will be both completion and performance based. 30 % of the homework grade will be completion. 70 % of the grade will be based on your performance on one selected problem.

4.3 Participation Extra Credit

For this class we will be using a system called TopHat. This is a class response system that tracks individual student responses. All students should have received a notification as to how to enroll in this service. Think of the service like a textbook for the class. Half of your participation extra credit grade will be from simply responding during class and the other half will be determined by the correctness of responses to in-class questions. Additionally, to get extra credit, you will need to respond to the attendance question at the very beginning of class that requires a code that I will give. At the beginning of every class you will be required to write a short (140 character) response summarizing the last class. At the end of every class you will be required to write a short response on what concept made the least sense. Additionally, at least two pertinent

questions to what was recently covered in class will be asked. It is highly recommended that all students do the required reading for each class period before arriving at class. The percentage of points that you earn on participation extra credit will be multiplied by 10 % and will be added to your next test grade.

4.4 Midterm Exams

The midterm exams will be in class exams. You will be allowed one formula sheet. You can put anything you want on said formula sheet. I recommend topics pertaining to electromagnetics. If you will be out of town for exam dates, notify me as soon as possible. You will need to take the exam before you leave town. To take the exam after you return, you will need to show unimpeachable proof that you did not know that you would be out of town for the time of the exam for less than 24 hours before the exam. If you cannot produce this proof, you will receive a zero on the exam.

4.5 Final Exam

There will be a cumulative final exam during the final exam period for this course - Thursday December, 11th from 8-10:00 am. For this exam you may bring your formula sheets from the previous two midterms as well as one new formula sheet.

5 Course Schedule

The following course schedule will be followed to the best of the instructor's ability. If a large deviation from the schedule is required, an announcement will be made in class. The exam and quiz dates are fixed, however, and will not be moved. The assigned reading is listed in the course outline for each class period. However, I recommend that you read through the entirety of *A Student's Guide to Maxwell's Equations* as soon as possible as the textbook gives an overview that will help you throughout the course.

Fields I				Assigned Reading	
Topic	Subtopic	Class #	Class Day	Cheng	SGME
Vector Analysis	Vector algebra and coordinate systems	0	Summer	2-1 through 2-4	Online Tutorial
	Vector calculus	0	Summer	2-5 through 2-12	Ch 1-5
Static Electric Fields	Maxwell's equations & Coulomb's Law	2	21-Aug	3.1-3.5	Ch 1
	Coulomb's and Gauss' Laws	3	26-Aug	3.1-3.4	
	Electric potential (and Voltage)	4	28-Aug	3.1-3.4	
	Electric dipole and force relations	5	2-Sep	3.5 and 3.6	
	Conductors and dielectrics properties	6	4-Sep	3.7-3.8	
	Boundary conditions, capacitance, and energy	7	9-Sep	3.9-3.11	
	Solution of Electrostatic Problems	Poisson's and Laplace's equations Laplacian/ Method of Images	8	11-Sep	4.1-4.4
Steady Electric Currents	Ohm's Law, EMF, Kirchhoff	9	16-Sep	5.1-5.4	
	Current boundary conditions and resistance	10	18-Sep	5.5-5.7	
	Exam 1	11	23-Sep		
Static Magnetic Fields	Magnetic forces and torque and Ampere's Law intro	12	25-Sep	6.1-6.5	Ch.2
	Dipole	Magnetic dipoles and Biot-Savart Law	13	30-Sep	6.1-6.5
	Ampere's Law and its applications	14	2-Oct	6.1-6.5	Ch. 4
	(Scalar and) Vector magnetic potentials	15	7-Oct	6.3	
	Magnetic materials	16	9-Oct	6.6-6.9	
	Magnetic boundary conditions and inductance	17	14-Oct	6.10-6.11	
	Magnetic energy and force relations	18	16-Oct	6.12	
	Time Varying Fields and Maxwell's Equations	Faraday's Law and displacement current	19	21-Oct	7.1-7.2
Time-varying fields and transformers		20	23-Oct	7.3-7.4	
Exam 2		21	28-Oct		
	Wave equation and time-harmonic fields	22	30-Oct	7.6-7.7	Ch. 5
	Wave propagation and polarization basics	23	4-Nov	8.1-8.2	
Plane Electromagnetic Waves	Plane waves in lossy media and Poynting vector	24	6-Nov	8.3-8.5	
	Plane wave reflections & boundary conditions	25	11-Nov	8.6 and 8.9	
Transmission Lines	Transmission Line Equations	26	13-Nov	9.1-9.3	
	Wave characteristics on Finite Transmission Lines	27	18-Nov	9.4	
	Wave characteristics on Finite Transmission Lines	28	20-Nov	9.4	
	Wave characteristics on Finite Transmission Lines	29	25-Nov	9.6-9.7	
	Smith Chart/Transmission Line Impedance Matching	30	2-Dec	Ch. 11	
	Intro to Antennas/ Course Review	31	4-Dec		
Cumulative	Final Exam	32	11-Dec		