COLORADO STATE UNIVERSITY

COURSE SYLLABUS
ECE340 - Electromagnetics for Computer Engineering

Instructor Information

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Office Location: Engineering B116   Office Hours: T/R 11am-12pm

Communication Policy: Responses to emails will be provided within 24 hours; available by appointment during non-office hours

Prerequisites for Course

ECE 202 and MATH 340

Textbook

Fawwaz T. Ulaby and Umberto Ravaioli, *Fundamentals of Applied Electromagnetics* - 8th edition, Pearson, 2020.

Additional References

Branislav M. Notaros, *Electromagnetics*, Pearson Prentice Hall, 2010.

Clayton R. Paul, *Electromagnetics for Engineers: With Applications to Digital Systems and Electromagnetic Interference*, Wiley, 2004.

Course Description & Objectives

The objective of this course is to familiarize students with fundamentals of electromagnetic theory and various computer engineering applications involving electromagnetic fields. Throughout the course, students will be immersed into basic vector analysis, waves and phasors, transmission lines, Maxwell's equations, static electric and magnetic fields, time-varying electromagnetic fields, wave propagation and radiation. This course also highlights the integration of electromagnetics and computer engineering applications such as VLSI design, silicon photonics, fiber optics, radar and communication systems.

Upon the completion of this course, students will be able to:

1. Understand the basics of waves, phasors, and vector analysis
2. Connect circuit theory and electromagnetic theory through transmission lines
3. Describe the properties of static electric and magnetic fields, as well as time varying fields
4. Understand the principles of wave propagation, reflection, transmission, and radiation
5. Relate basic electromagnetic knowledge to computer engineering applications such as circuit design, silicon photonics, and communication

Course Content:

Objectives	Course Topics
1	Electromagnetic waves and phasors; vector analysis: gradient, divergence, and curl; vector transformation between different coordinate systems
2	Transmission lines (general considerations, transmission line equations, the lossless microstrip/transmission line, wave impedance of the lossless line, impedance matching)
3	- Electrostatics (Maxwell's equations, Coulomb's law, Gauss's law, electric scalar potential, boundary conditions, capacitance, and electrostatic potential energy). - Magnetostatics (Magnetic forces and torques, Biot-Savart law, Maxwell's equations, boundary conditions, inductance, and magnetic energy). - Maxwell's equations for time-varying electromagnetic fields (Faraday's law, the ideal transformer, moving conductor in a time-varying field).
4	Wave propagation, transmission, and radiation (plan-wave propagation in lossless and lossy media, wave polarization).
5	Technology briefs in circuit design, silicon photonics, and communication

Course Schedule

WEEK	TOPIC/SUB-TOPIC	LEARNING OBJECTIVES
1	Course overview; historical timeline and the nature of electromagnetism; computer engineering applications of electromagnetics	1,2,3,4,5
2	Waves and phasors	1, 3, 5
3	Transmission lines	2, 5
4	Transmission lines	2, 5
5	Vector analysis	1
6	Vector analysis	1
7	Electrostatics	3
8	Electrostatics	3
9	Magnetostatics	3
10	Magnetostatics; Midterm	3
11	Maxwell's equations for time-varying fields	3
12	Maxwell's equations for time-varying fields	3
13	Plan-wave propagation	4
14	Wave reflection and transmission	4, 5
15	Wave reflection and transmission	4, 5
16	Engineering applications; Final exam	5

Grading Policy

Homework   30%

Pre-Class Quizzes   5%

Mid-term   30%

Final Exam   35%

GRADE	RANGE
A+	100% to 97%
A	<97% to 93%
A-	<93% to 90%
B+	<90% to 87%
B	<87% to 83%
B-	<83% to 80%
C+	<80% to 77%
C	<77% to 70%
D	<70% to 60%
F	<60% to 0%

Academic Integrity & CSU Honor Pledge

This course will adhere to the CSU Academic Integrity/Misconduct policy as found in the General Catalog and the Student Conduct Code.

Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, I will ask that you affirm the CSU Honor Pledge as part of completing your work in this course.

Important information for students: All students are expected and required to report any COVID-19 symptoms to the university immediately, as well as exposures or positive tests from a non-CSU testing location.

If you suspect you have symptoms, or if you know you have been exposed to a positive person or have tested positive for COVID, you are required to fill out the COVID Reporter (https://covid.colostate.edu/reporter/). If you know or believe you have been exposed, including living with someone known to be COVID positive, or are symptomatic, it is important for the health of yourself and others that you complete the online COVID Reporter. Do not ask your instructor to report for you. If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600. You may also report concerns in your academic or living spaces regarding COVID exposures through the COVID Reporter. You will not be penalized in any way for reporting. When you complete the COVID Reporter for any reason, the CSU Public Health office is

notified. Once notified, that office will contact you and, depending upon each situation, will conduct contact tracing, initiate any necessary public health requirements and notify you if you need to take any steps.

For the latest information about the University's COVID resources and information, please visit the **CSU COVID-19 site**: https://covid.colostate.edu/.