COLORADO STATE UNIVERSITY

COURSE SYLLABUS
ECE340 - Electromagnetics for Computer Engineering

05:00 - 06:15PM, T/R | Scott Building Room 231

Instructor Information

Name: Haonan Chen

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Office Location: Engineering B116 Office Hours: T/R 10am-12pm

Communication Policy: Responses to emails will be provided within 24 hours; available on Teams during non-office hours.

Prerequisites for Course

ECE 202 and MATH 340

Textbooks

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

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 in 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	Transmission lines	2, 5
6	Transmission lines	2, 5
7	Vector analysis	1
8	Vector analysis	1
9	Electrostatics	3
10	Electrostatics	3
11	Magnetostatics; Midterm	3
12	Magnetostatics	3
13	Maxwell's equations for time-varying fields	3
14	Fall Break	
15	Plan-wave propagation	4
16	Engineering applications; Final exam	5

Grading Policy

Homework	30%
Mid-term	30%
Final Exam	30%
Attendance	10%

GRADE	RANGE
A	100% to 90%
A-	<90% to 87%
B	<87% to 80%
C	<80% 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.