Department of Electrical Engineering and Computer Science
The University of Kansas

EECS 221- Electromagnetics I   **Fall, 2023**

Catalog Description: EECS 221 Electromagnetics I (3). Vector analysis. Electrostatic and magnetostatic fields in a vacuum and material media. Electromagnetic fields and Maxwell's equations for time-varying sources. The relationship between field and circuit theory. Simple applications of Maxwell's equations. Prerequisites: Math 127, Math 220, PHSX 210 or 211, EECS 211

Textbook: **Engineering Electromagnetics** by Kenneth R. Demarest, Prentice Hall, 1998

Course Objectives: To introduce the fundamental laws of electricity, magnetism, and electromagnetics, along with the vector algebra and calculus necessary to model these phenomena. Upon completion of this course, students should be capable of answering the questions: what is electricity; how does it behave, and; how can it be controlled?

Prerequisites by Topics:

Differential equations	Vector Calculus
Physics (mechanics)	dc and ac circuit analysis

Course Topics:

Vector algebra and calculus	Magnetostatic fields in free space and material media
Electromagnetic sources, forces, and fields	Magnetic circuits
Electrostatic fields in free space	Inductance and magnetic energy
Electrostatic fields in material media	Time-varying electromagnetic fields
Kirchoff's laws	Introduction to plane waves
Capacitance and electric energy	

Outcomes: Students should be capable of:

Using vector analysis and vector calculus
Defining electric and magnetic fields in terms of measurable forces
Calculating resistance, inductance, and capacitance
Solving electrostatic and magnetostatic boundary value problems
Writing and discussing the significance of Maxwell's equations

Outcomes Assessment:

Class participation and discussion	Homework
Hour exams and final exam	Semester-end course and instructor evaluations

Relationship of the course to the program outcomes and objectives:

(3.a) an ability to apply knowledge of mathematics, science, and engineering
(3.e) an ability to identify, formulate, and solve engineering problems

Tools Usage: None
Estimated Content:

Science :   3.0 hours (100%)

Instructor: Kenneth R. Demarest

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Office Hours: 9:30 - 11:00 MWF
9:30-11:00 and 1:30-3:00   Tu,Th

Zoom Info: Meeting ID: 955 1144 2187 , Passcode: 411316

Grading: The following percentages will be used to arrive at the final grade scores

> Exam I 25
> Exam II 25
> Final Exam 30
> Quizzes 10
> Homework 10

Course grades will be A, B, C, D, and F. Final letter grades are determined from the final grade scores using a scale similar to the traditional 90-100 A, 80-90 B, etc ..., but can vary from semester to semester. **A passing score must be earned in all categories (exams, quizzes, homework) to earn a passing grade for the course**. Changes announced in class supersede these written instructions. EECS 221 will *not* utilize +/- grading system.

Homework: Homework will be collected at the beginning of class on a weekly basis. Late homework is not accepted, except for unusual circumstances. Collaboration with classmates is permitted. Copying is *not* permitted and will dealt with by the Associate Dean of Engineering.

Exams: I will announce before each exam whether it will be closed book, closed book with "cheat sheet", or open book.

Quizzes: Quizzes will be random and unannounced, and always at beginning of class

Make-ups: Make-up exams are given rarely, and only if: 1) I am informed IN ADVANCE, and 2) I deem the reason to be sufficiently meritorious (job interviews and pleasure trips are not). If the reason is illness, documentation of the illness from a health-care professional is required. I do not consider a cold to be an illness.

Class decorum: The School of Engineering is a professional school, and this class will reflect that. You are expected to arrive on time, leave on time, and act professionally in class. This includes being intellectually and physically involved in the class.

Special Needs: Any student who has a disability that demands special accommodations should contact the instructor personally in order to make arrangements. Also, members of KU sanctioned organizations (band, athletic teams, etc.) that have special needs should also contact the instructor as the need arises.

Academic Misconduct: Instances of cheating may result in expulsion from class and referral to the Dean. Cheating includes, but is not limited to: copying another exam paper, copying another homework paper, copying from solution manuals or previous students' homework papers, having another student do your work, use of "tutoring" websites like chegg.com, etc.

Syllabus

Week	Topic/Chapter
1-2	Vector Analysis/ Chapter 2
3	Sources, Forces, and Fields/ Chapter 3
4-5	Static Electric Fields in Free Space/ Chapter 4

. . . . . **Exam I** (Monday, Oct 2 - tentative). . . . . . .

Week	Topic/Chapter
6-7	Electric Fields in Material Media/ Chapter 5
9	Capacitance and Electrostatic Energy/ Chapter 6
10	Magnetostatic Fields in Free Space/ Chapter 7
11	Magnetic Fields in Material Media/ Chapter 8

. . . . . **Exam II** (Wednesday, November 8 - tentative). . . . .

Week	Topic/Chapter
12-13	Inductance and Magnetostatic Energy/ Chapter 9
14	Time-Varying Electromagnetic Fields/Chapter 10

. . . . **Final Exam** . . (comprehensive, Monday, December 11, 1:30-4:00 pm) . . . .