

**Department of Electrical Engineering and Computer Science  
The University of Kansas**

**EECS 220- Electromagnetics I**

**Fall, 2026**

**Catalog Description:** EECS 220 Electromagnetics I (4). 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 202

**Instructional Mode:** In person class. Learned 2112, 12:00-12:50 PM MWF , Learned 2112 3:30-4:20 PM Tuesday

**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 : 4.0 hours (100%)

**Instructor:** Kenneth R. Demarest

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Office Hours: 9:00 - 10:30 , 3:00-4:00 MWF  
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, but possibly a point or two higher than, the traditional 90-100 A, 80-90 B, etc ..., and can vary from semester to semester. **A passing score (60%) must be earned in all categories (exams, quizzes, homework) to earn a passing grade for the course. In addition, a composite exam score of C (70%) or above must be attained to earn a course grade of C or above.** Changes announced in class supersede these written instructions. EECS 220 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**

| <u>Week</u>                                                                                  | <u>Topic/Chapter</u>                            |
|----------------------------------------------------------------------------------------------|-------------------------------------------------|
| 1-2                                                                                          | Vector Analysis/ Chapter 2                      |
| 3                                                                                            | Sources, Forces, and Fields/ Chapter 3          |
| 4-5                                                                                          | Static Electric Fields in Free Space/ Chapter 4 |
| . . . . . <b>Exam I</b> (Tuesday, September 29 - tentative). . . . .                         |                                                 |
| 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    |
| . . . . . <b>Exam II</b> (Wednesday, November 17 - tentative). . . . .                       |                                                 |
| 12-13                                                                                        | Inductance and Magnetostatic Energy/ Chapter 9  |
| 14                                                                                           | Time-Varying Electromagnetic Fields/Chapter 10  |
| . . . . <b>Final Exam</b> . . (comprehensive, Tuesday, December 15, 10:30am-1:00 pm) . . . . |                                                 |

## **Important Resource and Policy Information**

- Explanation of instructional time expected for out-of-class student work per credit:  
see <https://policy.ku.edu/registrar/credit-hour>.
- Accommodations and/or information for students with disabilities:  
see <https://access.ku.edu/syllabus-statement>.
- Sexual Harrassment Policy:  
see <https://policy.ku.edu/civil-rights/sexual-harassment>.
- Nondiscrimination, Equal Opportunity, and Affirmative Action Policy:  
see <https://policy.ku.edu/IOA/nondiscrimination>.
- KU Statement on Diversity and Inclusion: see <https://policy.ku.edu/provost/diversity-inclusion>.
- Academic Misconduct (USRR 2.7.1):  
see <https://policy.ku.edu/governance/USRR#art2sect6>.
- Change of Grade:  
see <https://policy.ku.edu/registrar/grade-change> and  
<https://policy.ku.edu/governance/USRR#art2sect3>.
- Code of Student Rights and Responsibilities:  
see <https://policy.ku.edu/student-affairs/student-code>.
- Commercial Note-Taking:  
see <https://policy.ku.edu/provost/commercial-note-taking>.
- Mandatory Reporting:  
see <https://policy.ku.edu/civil-rights/mandatory-reporting>.
- Racial and Ethnic Harassment Policy:  
see <https://policy.ku.edu/civil-rights/racial-ethnic-harassment-policy>.