

**SAN JOSE STATE UNIVERSITY
COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING**

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| EE 140 | Tuesday – Thursday 10:30 - 11:45 | Room: E 341 |
| PRINCIPLES OF ELECTROMAGNETIC FIELDS | | |
| Khosrow Ghadiri | | Fall 2008 |
| Office: E 371 | Office Phone: (408) 924-3916 Fax: (408) 924-3925 Email: kghadiri@sjsu.edu | Office Hours: Tues: 12:00-14:00 Tues: 16:30-18:30 Thurs: 12:00-14:00 Thurs: 16:30-18:30 |
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Course Description:

This course covers primarily aspects of electrostatics and static magnetic fields, including, in the beginning, vector algebra and calculus together with orthogonal coordinate systems will be discussed.

Prerequisites:

Mat 133A, Phys. 52 or 72, English 1A
EE 98 with a grade of C or better .

Learning Objectives:

Vector Analysis, Coordinate Transformations, Vector and Scalar Calculus, Coulomb's Law, Gauss's Law, Electric Energy and Potential, Conductors, Dielectrics and Capacitance, Method of Images, Boundary Conditions, Poisson's and Laplace's Equations, Biot-Savart Law, Ampere's Circuital Law, Magnetic Vector Potential, Inductance, Magnetic Energy and Force.

Relationship to Program objectives and ABET Program Criteria:

This course supports the achievement of the following objectives (numbers in parentheses refer to specific ABET criteria):

- (3.a) an ability to apply knowledge of mathematics, science, and engineering
- (3.c) an ability to design a system, component, or process to meet desired needs
- (3.e) an ability to identify, formulate, and solve engineering problems

(EE.3) a knowledge of advanced mathematics such as differential equations, differential and integral calculus, linear algebra and vector analysis.

In-Class Assessment Methods:

- Class participation
- Homework
- Two midterms and a final exam
- Course Survey

Textbook(s) and Other Required Material:

Electromagnetics for Engineers

Fawaz T. Ulaby, 2005, Prentice Hall. ISBN 0-13-149724-3

Note: The focus of EE 140 will be on chapters 1-5.

Reference(s):

1. Cheng, David K. "Fundamentals of Engineering Electromagnetics", , Addison Wesley Publishing Co., 1993.
2. Sadiku, M.N.O "Elements of Electromagnetics", 1994 , Saunders.
3. Demarest, Kenneth R. "Engineering Electromagnetics", 1998, Prentice Hall
4. Kraus, J.D. "Electromagnetics", McGraw-Hill, 1992.
5. Hayt, W. H. and Buck J. A "Engineering Electromagnetics," sixth edition McGraw Hill, 2001.

Homework

Homework assignments listed in the Course Schedule represent a minimum number of suggested practice problems for the students to solve to test their understanding of the material covered in lecture and constitute 10% of course grades

Exam

There will be 2 examinations in addition to the final non-comprehensive examination. The dates of these examinations are shown below. All exams will be closed-book and closed notes. **There will be no make-up exams. Any student who fails to take an examination will receive a letter grade of F for that particular examination.**

Grading

Letter grades will be assigned based on the distribution curves for each exam. **The overall grade will be ascertained from these letter grades using equal weight for all three exams, class project, quizzes and homework.**

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| Midterm 1 | 25% |
| Midterm 2 | 25% |
| Final | 35% |
| Homework and quizzes | 15% |

Honor Code

All students in the Department of Electrical Engineering are expected to subscribe to the following Honor Code:

I have read the honor code below and agree with its provisions. My continued enrollment in this course constitutes full acceptance of this code.

I will not:

- ✓ Take an exam in place of someone else, or have someone else take an exam in my place.
- ✓ Give information or receive information from another person during an exam.
- ✓ Use more reference material during an exam than is allowed by the instructor.
- ✓ Obtain a copy of an exam prior to the time it is given.
- ✓ Alter an exam after it has been graded and returned it to the instructor for re-grading.

Measures Dealing with Occurrences of Cheating

- A. The student or students involved in cheating should get an F in the evaluation instrument (paper, exam, project, homework etc.) and should get reported to the Department and the University.
- B. Second offense will result in suspension.

| <u>DATE</u> | <u>TOPIC</u> | <u>READING</u> |
|------------------------|--|----------------|
| Thurs 8/26/08 | Road map | Ch. 1 |
| Tues 8/28/08 | The nature of electromagnetism and electric field | pp 12-15 |
| Thurs 9/2/08 | Magnetic field | pp 15- 20 |
| Tues 9/4/08 | Vector algebra | pp 22- 30 |
| Thurs 9/9/08 | Orthogonal coordinates | pp 30- 37 |
| Tues 9/11/08 | Transformation between coordinates | pp 37- 41 |
| Thurs 9/16/08 | Vector calculus - Divergence | pp 49- 57 |
| Tues 9/18/08 | Curls of a vector field, Laplacian operator | pp 58- 62 |
| Thurs 9/23/08 | Electrostatics | pp 66- 70 |
| Tues 9/25/08 | <u>EXAM I</u> | Ch 1-3 |
| Thurs 9/30/08 | Coulomb's law | pp 71- 76 |
| Tues 3/8/08 | Gauss's law | pp 76- 79 |
| Thurs 10/2/08 | Electric scalar potential - Poisson's equation | pp 79- 83 |
| Tues 10/7/08 | Electrical properties of materials | pp 84- 88 |
| Thurs 10/9/08 | Dielectrics | pp 88- 93 |
| Tues 10/14/08 | Electric boundary conditions | pp 94- 99 |
| Thurs 10/16/08 | Capacitance - Capacitive sensors | pp 99- 104 |
| Tues 10/21/08 | Electrostatic potential energy – Image method | pp 104- 109 |
| Thurs 10/23/08 | Magnetostatics – Magnetic forces and torques | pp119-127, |
| Tues 10/28/08 | <u>EXAM II</u> | Ch 1-4 |
| Thurs 10/30/08 | The Biot-Savart law | pp 127- 133 |
| Tues 11/4/08 | Maxwell's magnetostatics equations - Gauss's law for magnetism | pp 133-134 |
| Thurs 11/6/08 | Ampere's law | pp 134-139 |
| Tues 11/11/08 | Veteran's Day Campus Closed | |
| Thurs 11/13/08 | Ampere – Maxwell's law | |
| Tues 11/18/08 | Vector magnetic potential | pp 139-140 |
| Thurs 11/20/08 | Magnetic properties of materials | pp 140-144 |
| Tues 11/25/08 | Magnetic permeability | pp 144-148 |
| Thurs 11/27/08 | Thanksgiving Campus Closed | |
| Tues 12/2/08 | Inductance – Magnetic recording | pp 149-152 |
| Thurs 12/4/08 | Self-inductance – Magnetic energy | pp 152-158 |
| Tues 12/9/08 | Review | |
| Friday 12/12/08 | <u>FINAL EXAM 9:45-12:00</u> | Ch. 1-5 |