EECS 180 ENGINEERING ELECTROMAGNETICS
(Required for EE; Elective for MSE)

Catalog Data: **EECS 180 Engineering Electromagnetics (Credit Units: 4)**
Electromagnetic fields and solutions to problems in engineering applications; Maxwell's equations and plane wave propagation, reflection, and transmission. Corequisites: Mathematics 2D and 3D. Prerequisite: Physics 7E. Formerly ECE170. (Design units: 1)

Textbook: Schwarz, S. E., *Electromagnetics for Engineers,* Saunders College Publishing, holt, Rinehart and Winston, Inc., 1990.

References: Cheng, David K., *Field and Wave Electromagnetics,* 2nd edition, Prentice-Hall, 1989.

Coordinator: Chen Tsai and Franco DeFlaviis

Course Objectives:
To provide the students a firm foundation in Engineering Electromagnetics.
To help the students review vector calculus and establish competence in their applications for the study of Engineering Electromagnetics.
To instill in the students an appreciation of the new and flourishing applications of Engineering Electromagnetics such as planar microwave technology, wireless and fiber optic communications.
To enhance the students analytical techniques and ability for the study of Electrostatics, Magnetostatics, and Time-Varying Electric and Magnetic Fields leading to Maxwell equations and their applications such as Uniform Plane Waves.
To instill in the students an appreciation of the general concept of Transmission Line and its broad applications to various fields in engineering and science.

Course Outcomes:
Students will:
Apply vector calculus to analyze simple electrostatic and magnetostatic fields, and are able to perform calculations involving various differential operators as well as line and surface integrals relating to Gauss and Stoke's theorems.
Describe the basic concepts of “capacitance” and “inductance” and the approaches for their calculations through the study of electrostatics and magnetostatics, and their connections to the discrete capacitance and induction used in basic electronic circuits.
Describe the major parameters and electromagnetic quantities involved in transmission line theory such as wave (characteristics) impendance, impendance matching and, transformation, standing wave ratio, reflection and transmission coefficients, etc., and usage of Smith chart.
Describe the coupling (or interaction) among time-varying electric and magnetic fields and the resulting Maxwell equations, and are able to apply them to simple problems.

Prerequisites By Topic:
Differential and integral calculus
Vector calculus

Freshman level electricity and magnetics
Algebra
Trigonometry

Lecture Topics: This one-quarter first course is aimed at providing a firm foundation in Engineering Electromagnetics to both specialists and nonspecialists undergraduates.

Class Schedule: Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.

Computer Usage: CAD software analysis, Sonnet EDA Simulation, HP Advanced Design System, Microwave Office.

Laboratory Projects:

Professional Component: Contributes toward the Electrical Engineering Topics Courses and Major Design experience.

Relationship to Program Outcomes: This course relates to Program Outcomes a and c as stated at: http://undergraduate.eng.uci.edu/degreeprograms/electrical/mission

Design Content Description

Approach: The design component is provided through lecture materials, homework, and tests.
Lectures: 50%
Laboratory Portion: 100%

Grading Criteria:

Class Participation:	10%
Homework:	20%
Midterm Exam:	35%
Final Exam:	35%
	100%

Estimated ABET Category Content:

Mathematics and Basic Science: 0 credit units or 0%
Engineering Science: 3 credit units or 75%
Engineering Design: 1 credit units or 25%

Prepared by: Chen S. Tsai **Date:** July 2007

CEP Approved: Fall 2004