

ELECTRICAL ENGINEERING DEPARTMENT
California Polytechnic State University

EE 335 Electromagnetic Fields and Transmission (4 units)

Spring 2005

Instructor: James G. Harris

Prerequisite: MATH 241, EE 212/242

Objective: The overall educational objectives are to give the junior EE students a basic understanding of Maxwell's equations and apply them to plane waves; a basic understanding of radio frequency, pulse, and power transmission lines; and the ability to use Smith charts for transmission line analysis, design and matching, and to relate the subject matter with the material presented in electric circuit theory.

Textbooks: Iskander, Magdy F., Electromagnetic Fields and Waves; Waveland Press; 2000; texts for PHYS 133, MATH 241, and EE 212

Recommended: Kraus, J. D.; Electromagnetism, 4th ed; McGraw-Hill; 1992

Hayt, W. H., Jr.; Buck, J. A.; Engineering Electromagnetics, 7th ed; McGraw-Hill; 2006

Inan, S. U., Inan, S. I.; Engineering Electromagnetics; Addison-Wesley; 1998

Cheng, D. K.; Field and Wave Electromagnetics, 3rd ed; Addison-Wesley; 1998

Ramo, Simon; Whinnery, John R.; Van Duzer, Theodore; Fields and Waves in Communication Electronics, 3rd ed; Wiley; 1993

Course Website Reference: <http://www.ee.calpoly.edu/~jharris>, and/or Blackboard(tbd)

Course Homework: Weekly homework assignments will be collected, corrected, graded, and returned. Students are encouraged to work in study groups; however, each student must turn in their own work. Late homework will not be accepted. There are planned projects using PSpice for homework assignments covering transmission line material; students can get a student version of PSpice on a CD from the senior project window (20-111).

Tests: All midterms and the final examination will be closed book and notes with no calculator. There will be an honor system imposed with a signed statement required by the student: "I have neither given nor received unpermitted aid during this examination".

Grades: The grade will be based upon the following proportion:

Homework	15%
Two Midterms (@25%)	50%
Final Exam	35%

Improvement or degradation in student performance over the quarter will be used to resolve borderline cases.

Office Hours: MWF 11:10-12:00; MW 2:10-3:00; 20-305 x65708; jharris@calpoly.edu

Other times will be available by arrangement.

Notes to the student: There may be times when the instructor must be absent from the class in order to participate in national engineering education activities; other assistance will be provided during these periods. Your understanding and patience are appreciated.

EE 335 COURSE SCHEDULE – tentative

Spring 2005

Date	Reading	Comments
M 3/28	7.2-3	introduction; distributed circuit transmission line model
W 3/30	7.4-6	loseless TL solution, boundary conditions
F 4/1	7.8-9	time domain analysis; step and pulse response
M 4/4	7.10	sinusoidal steady-state TL solution; HW 1 due
W 4/6	7.11	boundary conditions, reflection coefficient; impedance
F 4/8	7.13	VSWR, power flow, analytical solution
M 4/11	5.6;7.12,15	smith chart TL solutions; HW 2 due
W 4/13	7.14	impedance matching – single and double stub

F 4/15	7.2,10	lossy TL, power flow
M 4/18	1.1-2	review of vector algebra; HW 3 due
W 4/20	1.3-5	vector coordinate systems; review
F 4/22		exam 1
M 4/25	1.6	electric and magnetic fields; HW 4 due
W 4/27	1.7-8	vector integration; Maxwell's equations in integral form
F 4/29	1.9-10	displacement current; characteristics of Maxwell's equations
M 5/2	2.1-3	vector differentiation and gradient; HW 5 due
W 5/4	2.4-6	divergence and divergence theorem; applications
F 5/6	2.7-10	curl and Stoke's theorem; applications
M 5/9	2.11-12	continuity equation, displacement current, wave eq.; HW 6 due
W 5/11	2.13-14	harmonic fields; uniform plane wave
F 5/13	2.14-15	polarization of plane waves
M 5/16	4.1-4	electrostatic fields; electrostatic potential; HW 7 due
W 5/18	4.5-7	capacitance, Laplace and Poisson's equations; review
F 5/20		exam 2
M 5/23	4.10	magnetostatic fields; vector magnetic potential; HW 8 due
W 5/25	4.11	magnetic circuits
F 5/27	4.12-13	self- and mutual inductance; magnetic energy
M 5/30	Holiday	
W 6/1	7.1	transmission line analysis; HW 9 due
F 6/3		review

Final Exam - comprehensive

How to be a successful student in EE 335:

1. plan on spending a minimum of 8 hours per week outside of lecture
2. do the reading assignment before lecture – come to class prepared with questions
3. form a study group (three people are best) – meet before homework is due and exams
4. reference your texts for calculus, physics and circuits to review prerequisite material in:
 - a. vector calculus (MATH 241) - vector algebra, integration (line, surface, volume), differentiation (derivative, gradient, divergence, curl)
 - b. physics (PHYS 133) – wave equation and motion, charges and electric fields (q , \mathbf{E} , \mathbf{D}), currents and magnetic fields (I , \mathbf{H} , \mathbf{B}), properties of materials (σ , ϵ , μ)
 - c. circuits (EE 112/211/212) – solution of linear differential equations; linear analysis in time (transient and steady-state) and frequency (phasor and impedance) domains; sinusoidal steady-state analysis (complex power)
5. review all text examples and do all the homework – ask questions in lecture on examples, and understand solutions to all homework problems; attempt your homework solution without making reference to any solutions in the public domain
6. take advantage of the office hours to answer individual questions
7. review previous exam reviews and midterms on the website in both EE 335 and EE 334 – use these resources to assist you in memorizing the definitions and laws/principles of electromagnetic theory; use dimensional analysis to assist in memorizing formulas; be able to derive results from definitions and laws/principles
8. strategy for taking exams: initially, read all problems; then, answer questions that yield 70% of the total, checking all results; finally, complete other problems as time permits