EE 692 – Advanced Engineering Electromagnetics
Fall 2011

Instructor: Dr. Keith W. Whites
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Office hours: MWF 11:00 AM-12:00 PM

Contacting Instructor: Please use e-mail rather than the telephone. All e-mail will be answered. The instructor will be available for assistance during the hours listed above, as well as other times when the office door is open.

Catalog Description: (3-0) 3 credits. Prerequisites: Undergraduate course in electromagnetics, or the equivalent, and knowledge of a mathematics package; or permission of instructor. The course will cover topics often encountered in engineering electromagnetics practice including uniform plane waves and their normal and oblique scattering from planarly-layered media; physical optics and scattering by strips; metallic waveguides and resonant cavities; and dielectric slab waveguides.

Time and Location: Monday and Wednesday from 2:30-3:45 PM in room 208 EEP.

Course Reference Materials:

1. C. A. Balanis, *Advanced Engineering Electromagnetics*. New York: John Wiley & Sons, 1989. (Course text, required)
2. S. Ramo, J. R. Whinnery and T. Van Duzer, *Fields and Waves in Communication Electronics*. New York: John Wiley & Sons, third ed., 1994. (Recommended)
3. D. M. Pozar, *Microwave Engineering*. Hoboken, NJ: John Wiley & Sons, third ed., 2005. (Recommended)

Grading:
35 % – Homework
25 % – Mid-term exam
25 % – Final exam
15 % – Computer projects

Computer Projects: A number of computer projects will assigned during the semester. These assignments must be completed using a mathematics package such as *Mathematica*, *Matlab* or *Mathcad*.

Homework Policy: Homework assignments and computer projects must be turned in at the beginning of the class period on the due date. Late homework will be assessed a 10% point reduction per calendar day.

Exam Policy: The mid-term and final exams will be closed book and closed notes with no formula sheets. Using or referring to equations stored in a calculator is not allowed, even if these equations come pre-programmed into the calculator.

Honor System: All homework, computer projects and exams must be your own work. Failure to abide by this rule will result, at a minimum, in a zero score for the assignment and/or further action following SDSMT regulations. Homework solutions and computer projects can be discussed with your colleagues but the work you submit must be your own.

Americans with Disabilities Act (ADA) Statement: Students with special needs or requiring special accommodations should contact the campus ADA coordinator, Jolie McCoy, at 394-1924 and/or the instructor at the earliest opportunity.

Freedom in Learning Statement: Students are responsible for learning the content of any course of study in which they are enrolled. Under board of regents and university policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any course of study. Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should contact the dean of the college which offers the class to initiate a review of the evaluation.

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Class Schedule
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Date	Section	Topic
8/31	1.2, 1.3, 1.5, 1.6, 1.7	Introduction. Maxwell's equations. Constitutive relations. Boundary conditions. Power and energy. Time-harmonic electromagnetic fields.
9/5	–	**No class.**
9/7	3.2-3.4	Solution to the time-harmonic wave equation in Cartesian coordinate system.
9/12	4.2.1	Transverse electromagnetic waves.
9/14	4.2.2	Uniform plane waves in lossless media at oblique angles.
9/19	4.3	Transverse electromagnetic waves in lossy media.
9/21	4.4	Polarization of TEM waves.
9/26	5.2	Uniform plane waves normally incident on a lossless half space.
9/28	5.3.1	E polarized UPWs obliquely incident on a lossless half space.
10/3	5.3.2	H polarized UPWs obliquely incident on a lossless half space. Duality.
10/5	5.3.3, 5.3.4	Brewster angle of incidence. Critical angle of incidence.
10/10	–	**No class.**
10/12	5.4.2	Lossy media. UPW normally incident on a dielectric-conductor interface.
10/17	5.5.1	UPW scattering by a single slab layer.
10/19	Notes	UPW scattering by multiple slab layers.
10/24	5.5.2	Low reflection, multi-layer slab design.
10/26	–	**Mid-term exam.**
10/31	Notes	Applications of multi-layer UPW theory.
11/2	7.10	Physical optics.
11/7	11.3.1	TM^z and TE^z plane wave scattering by a PEC strip using PO.
11/9	8.2.1, 8.2.2	TE and TM modes in rectangular waveguides.
11/14	Notes	General behavior of rectangular waveguides.
11/16	8.2.3-8.2.5	Rectangular waveguides: TE_{10} mode, power density and power, attenuation.
11/21	Notes	Equivalent TL model of waveguides.
11/23	–	**No class.**
11/28	8.3	Rectangular resonant cavities.
11/30	8.7.5	TE and TM modes in a grounded dielectric slab waveguide.
12/5	8.7.5	Solutions to characteristic equation for a grounded dielectric slab waveguide.
12/7	9.2	Circular metallic waveguides, TE^z and TM^z modes
12/12	–	**Final exam**, 4:00-5:50 PM