Course Syllabus: EE 363M Introduction to Microwaves; Unique Number 14755
Spring, 2000; M-W-F 10:00-11:00, ENS 116
Instructor: Dean P. Neikirk, office ENS 635, phone 471-4669: MERB 1.606F, 471-8549
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Class home page: http://weewave.mer.utexas.edu/DPN_files/courses/363M/EE363Msyl.html
Office Hours: M-W-F: 9:00-10:00; afternoons by appointment
Prerequisites: EE 325; EE 325K won't hurt, but is not required

Objectives: The purpose of this course is to provide students with background in the behavior of high frequency / high speed components. There is an increasing need for engineers with a working understanding of the properties of circuits carrying signals containing very high frequencies (i.e. $f > 10^9$ Hz), as both analog and digital systems increase in speed. In this course, emphasis will be placed on the fundamental aspects of (mainly guided) wave transmission and propagation. An extensive discussion of the properties of transmission line circuits will be included. Modeling of digital interconnects at both the IC and printed circuit board levels will be included.

Topics to be discussed by the class:

1. Review of electrostatics
2. "Lumped" versus "distributed" circuits; time domain behavior
3. Transmission lines and Smith Charts
4. Maxwell's Equations
5. Plane waves, reflection and transmission at dielectric interfaces
6. Quasi-static solutions and Conformal mapping: microstrip and CPW
7. Finite conductivity and its impact on T-lines; delay in RC lines
8. Microwave networks, scattering matrices, and S-parameters
9. Metallic waveguides (we may skip this in favor of some microwave CAD work)

Text Book: I will attempt to give almost self-contained lectures. We will use as a text, however, Microwave Engineering: Passive Circuits, By Peter A. Rizzi (Prentice Hall, 1988). I will make every attempt to use nomenclature which is consistent with this text, and try to coordinate lectures with readings from Rizzi. Other useful references: Fields and Waves in Communication Electronics by S. Ramo, J. R. Whinnery, and T. Van Duzer, (this book is not cheap, but if you believe you will work further in electromagnetics, it is a good, classic work); Microwave Engineering, by D. Pozar, Addison-Wesley Publishing Co. (1990).

Grades
Your grades will be based upon performance on homework and exams. Homework will be assigned approximately weekly; credit for late homework will be reduced at a rate of 10% per class the work is late.
The weighting for different areas is:

		The worst-case grades will be based on:	
Homework	20%	A	100-90% of total points available
Exam I	25%	B	80-89%
Exam II	25%	C	70-79%
Final	30%	D	55-70%
	100%	F	0-55%

THE UNIVERSITY OF TEXAS AT AUSTIN PROVIDES UPON REQUEST APPROPRIATE ACADEMIC ADJUSTMENTS FOR QUALIFIED STUDENTS WITH DISABILITIES. FOR MORE INFORMATION, CONTACT THE OFFICE OF THE DEAN OF STUDENTS AT 471-6259, 471-4241 TDD OR THE COLLEGE OF ENGINEERING DIRECTOR OF STUDENTS WITH DISABILITIES AT 471-4382.

OFFICIAL UNIVERSITY CALENDAR AVAILABLE AT: http://www.utexas.edu/student/registrar/00-01long.html

LAST DAY TO DROP: 4TH DAY OF CLASSES (Jan. 19); BETWEEN THEN AND Feb. 12 MUST GO TO DEAN'S OFFICE; AFTER Feb. 12 THERE MAY BE AN ACADEMIC PENALTY; after March 26 drops allowed by UT only for extreme non-academic reasons. Two weeks prior notice of planned absences for the observance of religious holy days is required. (See General Information, chapter 4, for requirements: http://www.utexas.edu/student/registrar/catalogs/gi99-00/ch4/ch4g.html - attend.)

Course Evaluation: University and optional in-house survey during last week of class.

Policy on CHEATING:

You are expected to do your own work at ALL times. I expect you will often discuss assignments, but you MUST do your own ORIGINAL written work. Any evidence of cheating or plagiarism* will be treated as grounds for FAILURE in the class.

The following is extracted from the document "On Being A Scientist: Responsible Conduct In Research" by the COMMITTEE ON SCIENCE, ENG, NATIONAL ACADEMY OF ENGINEERING, INSTITUTE OF MEDICINE, NATIONAL ACADEMY PRESS, Washington, D.C. 1995.

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*"A CASE OF PLAGIARISM

"May is a second-year graduate student preparing the written portion of her qualifying exam. She incorporates whole sentences and paragraphs verbatim from several published papers. She does not use quotation marks, but the sources are suggested by statements like '(see . . . for more details).' The faculty on the qualifying exam committee note inconsistencies in the writing styles of different paragraphs of the text and check the sources, uncovering May's plagiarism.

"After discussion with the faculty, May's plagiarism is brought to the attention of the dean of the graduate school, whose responsibility it is to review such incidents. The graduate school regulations state that 'plagiarism, that is, the failure in a dissertation, essay, or other written exercise to acknowledge ideas, research or language taken from others' is specifically prohibited. The dean expels May from the program with the stipulation that she can reapply for the next academic year." [URL: http://www.nap.edu/readingroom/books/obas/contents/misconduct.html#Plagiarism]

"A broad spectrum of misconduct falls into the category of plagiarism, ranging from obvious theft to uncredited paraphrasing that some might not consider dishonest at all. In a lifetime of reading, theorizing, and experimenting, a person's work will inevitably incorporate and overlap with that of others. However, occasional overlap is one thing; systematic use of the techniques, data, words, or ideas of others without appropriate acknowledgment is another." [URL: http://www.nap.edu/readingroom/books/obas/contents/appendix.html#Plagiarism]

Policy on use of class news group:

We have a newsgroup set up on the net for this class at utexas.class.ee440. This newsgroup is for **class business ONLY**. Homework or questions from lecture are appropriate topics for discussion. THE NORMAL RULES OF CIVIL DISCOURSE SHOULD BE FOLLOWED AT ALL TIMES. I will read the postings regularly, and enter into discussions as appropriate.

Readings should be completed BEFORE coming to class. THIS SCHEDULE IS OPTIMISTIC!! WE WILL PROBABLY FALL BEHIND.

	Date	Topic	Ramo 3rd Edition	Pozar	Rizzi
1	1/19	Introduction	1-11, 27-28	1-10, 12-22	1-13, 12-22
2	1/21	Lumped circuits and Kirchoff's Laws	171-180, 186-198		
3	1/24	Distributed circuits, transmission lines	198-208, 213-229	67-70	57-60
4	1/26	Propagating solutions, reflections & transmission		114-121	61-69
5	1/28	Pulses on series terminated lines; capacitive loads			
6	1/31	bandwidth of digital signals; sinusoidal solutions;	229-236	67-70, 76-84	69-73
7	2/2	sinusoidal solutions			74-97
8	2/4	Generalized T-lines; R(L)C T-lines	245-267		
9	2/7	RLC T-lines: low and high freq. behavior			
10	2/9	When can you use lumped elements?			
11	2/11	T and Pi equivalent circuits at “low” frequency			
12	2/14	Smith Charts	236-245	84-92	97-104
13	2/16	Smith charts cont., Matching problems		92-96, 97-105, 288-301	105-113, 118-140
14	2/18	Double stub tuners; Maxwell's Equations	126-142, 274-283		140-142; 24-33
15	2/21	Plane & TEM waves; Phase & group velocity	438-442	22-32	
16	2/23	TEMs and T-lines; coax		70-76	72-73
17	2/25				
18	2/28	Dielectric stacks and T-line models	287-299	103-106	
19	3/1				
20	3/3	EXAM 1			
21	3/6	Waves in metals; Waves in lossy media	149-158, 283-287	38-46	40-45
22	3/8	Conductor surface impedance	180-186		
23	3/10	Quasi-static solutions; conformal mapping	331-351		
	3/13	SPRING BREAK			
24	3/20				
25	3/22	Conformal mapping: coax			
26	3/24	Conformal mapping: twin lead, microstrip			182-190
27	3/27	Microstrip transmission line; planar T-lines	410-417		190-201
28	3/29	μstrip design and construction		177-190	
29	3/31	loss in microstrip; incremental inductance rule	407-410	112-114	
30	4/3	dielectric loss and "slow waves"			
31	4/5	Microwave Networks	530-536	205-206, 216-220	347-358
32	4/7				
33	4/10	Scattering matrices and S-parameters	536-545	220-224	
34	4/12	Reciprocity & networks; signal flow graphs	554-557	224-231; 245-251	
35	4/14				
36	4/17	directional couplers	557-561	386-394	358-380
37	4/19	EXAM 2			
38	4/21	circulators and isolators		383-386	
39	4/24	Metallic waveguide	417-428	141-142	
40	4/26	Rectangular metallic waveguide	433-438	143-151	299-311
41	4/28	Rectangular metallic waveguide			
42	5/1	mode patterns in rectangular waveguide		150	
43	5/3	Loss in waveguide			
44	5/5	Magic T's last class			
	5/13	**FINAL: Friday, May 12, 2:00-5:00**			