ECE 584 Microwave Engineering I

Fall 2015:
ELAB 305, T/R 1:00-2:15
Moodle Website: https://moodle.umass.edu/course/view.php?id=23143

Your Instructor: Stephen Frasier
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Office Hours: by appointment

Teaching Assistant: TBD

Labs: There are six experiments. To begin in late September or early October.

Topics: Approximately 2--2.5 weeks (4--5 lectures) per chapter...

Electromagnetic Theory Review, Chapter 1**:**
Review of Maxwell's equations, boundary conditions, the wave equation, energy and power, image theory.

Transmission Line Theory, Chapter 2:
Lumped-element equivalent circuit model, Telegrapher's equation, field analysis of transmission lines, the Smith Chart, impedance mismatches and reflections.

Transmission Lines and Waveguides, Chapter 3:
TEM, TE and TM electromagnetic waves, parallel-plate waveguide, rectangular waveguide, coaxial line and cylindrical waveguide, planar transmission lines: stripline and microstrip.

Midterm: Thurs Oct 29, 7-9 pm, location TBD

Microwave Networks, Chapter 4:
Equivalent voltages and currents, characterization of networks by impedance (Z), admittance (Y), scattering (S), and transmission (ABCD) matrices, signal-flow graphs.

Impedance Matching and Tuning, Chapter 5:
Lumped-element tuning, single-stub and double-stub tuning, quarter-wave transformer, multi-section matching transformers.

Microwave Resonators, Chapter 6:
Review of series and parallel resonant circuits, quality factor (Q), transmission-line resonators, waveguide cavity resonators, dielectric resonators.

Final Exam: Fri Dec 18, 10:30 am – 12:30 pm, Elab 305

Grading: 20% laboratory, 10% homework, 35% Midterm, 35% Final

Course Objectives and Outcomes for ECE 584, Fall 2015

Objectives: Students completing this course will know

1. how to apply Maxwell’s equations to various canonical situations for free space, waveguides, and cavity resonators.
2. how to characterize microwave systems and components in terms of network theory (Scattering matrix, ABCD matrix, impedance matrix, etc.)
3. how to analyze and design tuning networks and matching transformers for microwave systems.
4. how to make fundamental measurements related to microwave engineering (VSWR, S-parameters, etc.)
5. how to interpret and manipulate graphical representations of microwave components and systems via the Smith chart.

Professional Component: Credits of engineering science: 3, Credits of design: 1

Relationship of course objectives to program outcomes:

PROGRAM OUTCOMES	COURSE OBJECTIVES				
	1	2	3	4	5
1. Well grounded in the fundamental concepts of math, physics, chemistry, computer science and engineering science.	X	X	X		
2. Able to identify, to formulate, and to solve problems in ECE.	X	X	X	X	X
3. Able to design and to conduct experiments, and to analyze and interpret measured data.				X	
4. Capable of designing analog and digital systems, components, and processes to meet desired needs.		X	X	X	X
5. Proficient in using modern engineering techniques and computing tools for effective engineering science.			X	X	X
6. Experienced in engineering teamwork and solving technically diverse problems.				X	
7. Able to communicate effectively both orally and in writing and through symbolic and graphical expression.				X	X
8. Aware of professional and ethical responsibilities as engineers.					
9. Aware of the impact of ECE technology and decisions on society.					
10 Motivated about the importance of lifelong learning and professional development.					