**ECE 584 Microwave Engineering I**
Fall 2011: ELAB 325, T/R 1:00-2:15
Course Website: on Moodle

**Instructor:** Stephen Frasier  
113A Knowles Engineering Building  
frasier@ecs.umass.edu

**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, Chapter 1:**  
Maxwell's equations, boundary conditions, the wave equation, energy and power, image theory

**Transmission Line Theory, Chapter 2:**  
Lumped element equivalent, field analysis, the Smith chart, impedance mismatches

**Transmission Lines and Waveguides, Chapter 3:**  
TEM, TE and TM waves, Parallel plate waveguide, Rectangular waveguide, Coaxial lines, stripline and microstrip

**Midterm:** on or about Wednesday, Oct 24 (evening)

**Microwave Networks, Chapter 4:**  
Equivalent voltages and current, impedance, admittance, scattering, and transmission (ABCD) matrices, source functions for waveguides.

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

**Microwave Resonators, Chapter 6:**  
Series and parallel resonant circuits, transmission line resonators, waveguide cavity resonators, dielectric resonators.

**Final:** TBD

**Grading:** 25% laboratory, 10% homework sets, 30% Midterm, 35% Final
Course Objectives and Outcomes for ECE 584, Fall 2012

**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:

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