

**School of Engineering and Computer Science**  
**ECE 425: RF Devices and Circuits**  
**Master Syllabus**

<b>Catalog Data:</b>	<b>ECE 425: RF Devices and Circuits</b> ; 3 credits (2-3) Semiconductor devices and circuit design targeting wireless applications.
<b>Class Schedule:</b>	2 lecture hours per week, for one semester.
<b>Laboratory Schedule:</b>	One 3-hour lab session, for one semester.
<b>Prerequisites by Course:</b>	ECE 341 and ECE 370
<b>Prerequisites by Topic:</b>	<ol style="list-style-type: none"> <li>1. An understanding of signals and systems.</li> <li>2. Knowledge of electromagnetic field theory, electronic circuit theory and communication systems.</li> </ol>
<b>Typical Text:</b>	David M. Pozar, <i>Microwave Engineering, 4th. Ed.</i> , John Wiley & Sons, 2012, ISBN 0-470-63155-4
<b>Course Coordinator:</b>	Dr. Tutku Karaçolak
<b>Course Objectives:</b>	Students will: <ol style="list-style-type: none"> <li>1. Analyze and design RF transmission line media including coaxial line, microstrip, stripline, waveguide.</li> <li>2. Analyze and design microwave matching networks.</li> <li>3. Understand the fundamentals of passive microwave components including couplers, power dividers, and filters.</li> <li>4. Perform measurements of microwave circuits using a network analyzer.</li> <li>5. Analyze and design active microwave components including linear RF amplifiers, mixers, and oscillators.</li> <li>6. Use RF CAD programs to analyze and design RF circuits.</li> <li>7. Implement and test discrete RF circuits in the laboratory.</li> </ol>
<b>Topics Covered:</b>	<ol style="list-style-type: none"> <li>1. Review of transmission line theory and Smith Chart</li> <li>2. Waveguide theory (rectangular and circular waveguides)</li> <li>3. Characteristics of TE, TM, and TEM modes</li> <li>4. Microwave network analysis and scattering parameters</li> <li>5. Impedance matching and tuning</li> <li>6. Passive microwave circuit elements (Directional Couplers, Power Dividers, Resonators, Hybrids, Magic Tee, Attenuators, etc.)</li> <li>7. Microwave filter design</li> <li>8. Noise and active microwave components (Diodes, Transistors)</li> <li>9. Microwave amplifier design</li> <li>10. Oscillators</li> <li>11. Mixers</li> </ol>
<b>Lab Experiments and Activities:</b>	Topics covered will be demonstrated in laboratory sessions as needed to measure, analyze, and design passive and active microwave circuits.

<b>Course Outcomes:</b>	Students will be able to:		
	<b>Assessed for Student Outcomes</b>	6-b. Use engineering equipment and instruments such as network analyzer, spectrum analyzer, signal generator, and waveguides for RF/microwave experiments. 6-c. Conduct analysis and interpretation of experimental data using appropriate data processing tools such as MATLAB and Microsoft Excel. 6-d. Draw conclusions by evaluating experimental results with respect to microwave circuit theory.	
	<b>Other Outcomes</b>	1-a. Demonstrate knowledge of guided wave and network theories and their applications in high frequency electronics. 3-a. Produce lab or project reports describing results of experiments or projects regarding guided waves and microwave circuits.	
<b>Relationship of Course to Program:</b>	Meets: Educational Objectives <u>1, 2, 4</u> Student Outcomes <u>1, 3, 6</u>		
<b>Prepared by:</b>	Dr. Tutku Karaçolak	<b>Date:</b>	March 2, 2018; 3/21/18 (mb) reviewed 01/12 Reviewed 02/12