



University of Tehran
School of Electrical and Computer Engineering

Course:	8101820 – Active Microwave Circuits										
Course type:		EE*					CE*			Credit: 3	
		Com	E	P	B	Con	D	SW	HW		IT
	Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
	Elective	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Level:	Undergraduate <input type="checkbox"/> Graduate <input checked="" type="checkbox"/>										
Co-requisite(s):	None										
Prerequisite(s):	Microwave I (8101328) , Communication Circuits (8101366)										
Prerequisite by topic:	Transmission line theory, circuit theory, complex analysis										
Textbook(s):	<p>[1] G. Gonzalez, <i>Microwave Transistor Amplifiers: Analysis and Design</i>. Pearson Education, 2nd Ed., 1996.</p> <p>[2] D. M. Pozar, <i>Microwave Engineering</i>. John Wiley & Sons, 3rd ed., 2004.</p> <p>[3] R. E. Collin, <i>Foundations for Microwave Engineering</i>. 2nd ed. Wiley-IEEE Press, 2001.</p>										
Coordinator:	Mahmoud Shahabadi, Professor , School of ECE										
Goals:	The course covers analysis and design of active microwave subsystems such as small and large-signal amplifiers, and oscillators. Various analytical techniques such as Harmonic-Balance method are introduced to make the techniques used in modern computer-aided design tools understandable for graduate students. Practical aspects of fabrication of active microwave circuits are mentioned and various commonly used microwave technologies are covered. Advanced computer-aided design tools are employed for the design of typical active microwave circuits.										
Outcome:	<p>Upon successful completion of the course, students will be able</p> <ol style="list-style-type: none"> 1. to understand the basic setup for measurement of scattering parameters, 2. to understand the principle of noise generation and measurement at microwave frequencies, 3. to choose suitable technology for a given microwave subsystem, 4. to select appropriate circuit topology and circuit components for small-signal and large-signal amplifiers, 										

	<p>5. to understand various analytical techniques for the analysis and design of typical active microwave circuits,</p> <p>6. to apply advanced CAD tools.</p>						
Topics:	<ol style="list-style-type: none"> 1. Introduction to Active Microwave Circuits 2. Scattering Parameters (generalized and conventional, measurement techniques, definitions of power gain for two-ports) 3. Noise in Linear Two-Ports (noise description, noise sources, noise measurements) 4. Small-Signal Amplifier Design (stability analysis, matching and noise requirements) 5. Power Amplifier Design (nonlinearity, harmonic distortion, harmonic balance analysis) 6. Microwave Oscillators (method of analysis for circuits with slowly varying amplitude and phase, typical microwave oscillators) 						
Computer usage:	MATLAB, ADS, Momentum, Ansoft HFSS						
Assignments:	10-14 homework assignments along with drills						
Projects:	<ul style="list-style-type: none"> • Computational project on analysis of active microwave circuits • Theoretical project on various subjects such as stability analysis • Alternatively, design and fabrication project 						
Grading:	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Assignments:</td> <td style="text-align: right;">30%</td> </tr> <tr> <td>Midterm exam</td> <td style="text-align: right;">35%</td> </tr> <tr> <td>Final exam:</td> <td style="text-align: right;">35%</td> </tr> </table>	Assignments:	30%	Midterm exam	35%	Final exam:	35%
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Final exam:	35%						
Further readings:	<p>[1] G. D. Vendelin, A. M. Pavio, U. L. Rohde, <i>Microwave Circuit Design Using Linear and Nonlinear Techniques</i>. 2nd Edition, Wiley-Interscience, 2005.</p> <p>[2] S. A. Maas, <i>Nonlinear Microwave and RF Circuits</i>. Artech House, 2nd Ed., 2003.</p> <p>[3] IEEE, Trans. on Microwave Theory and Techniques.</p>						
Prepared by:	Mahmoud Shahabadi						
Date:	January 1, 2017						

*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		