

University of Puerto Rico  
 Mayagüez Campus  
 College of Engineering  
 Department of Electrical and Computer Engineering

**Course Syllabus**

<b>1. General Information:</b>	
Alpha-numeric codification: INEL 5306 Course Title: Microwave Engineering Number of credits: 3 Contact Period: 3 hours of lecture Elective in INEL	
<b>2. Course Description:</b>	
English: Rectangular and circular waveguides; passive components; tubes and solid state devices used in microwave systems.	
Spanish: Guías de onda rectangulares y circulares; componentes pasivos; tubos y dispositivos de estado sólido utilizados en sistemas de microondas.	
<b>3. Pre/Co-requisites and other requirements:</b>	
INEL 4152,	
<b>4. Course Objectives:</b>	
This course is intended to provide senior students with the theory of operation of microwave devices and components, and with fundamentals of microwave transistor amplifier design, with the purpose of understanding the operation of microwave systems and circuits.	
<b>5. Instructional Strategies:</b>	
<input checked="" type="checkbox"/> conference <input type="checkbox"/> discussion <input checked="" type="checkbox"/> computation <input type="checkbox"/> laboratory  <input type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input type="checkbox"/> workshop  <input type="checkbox"/> art workshop <input type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input type="checkbox"/> special problems <input type="checkbox"/> tutoring  <input type="checkbox"/> research <input type="checkbox"/> other, please specify: Student presentations, Seminar by Industry Professionals (if available).	
<b>6. Minimum or Required Resources Available:</b>	
Individual and group assignments <b>requiring</b> the use of software packages to design and analyze microwave circuits. Software: HP Advanced Design System (ADS) available for the students.	
<b>7. Course time frame and thematic outline</b>	
Topic	Hours
Review: Transmission lines	2
Review: Smith Chart, load matching	2
Review: Microstrip lines	2
Scattering Parameters	3
ABCD matrix	2
Impedance matching	3
Noise in microwave circuits	2
Basic amplifier design	5
Power Dividers	3
Couplers and Hybrids	6
Microwave Filters	5
Waveguides	2

Mixers, switches	4
Microwave Systems	2
Exams	3

**8. Grading System**

Quantifiable (letters)  Not Quantifiable

**9. Evaluation Strategies** (Suggested): The faculty member teaching the course will provide the student with the evaluation strategy he/she will be using throughout the semester. This will be done within the first week of classes.

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2	50
<input checked="" type="checkbox"/> Final Exam	1	25
<input type="checkbox"/> Short Quizzes		
<input type="checkbox"/> Oral Reports	1	
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input type="checkbox"/> Projects		
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Assigned problems	6-8	25
<b>TOTAL:</b>		<b>100%</b>

**10. Bibliography:**

David M. Pozar, *Microwave Engineering*. John Wiley and Sons Inc. 3rd Edition, 2005.  
 Peter A. Rizzi, *Microwave Engineering, Passive Circuits*, Prentice Hall, 1988.  
 G.D. Vandelin, A.M. Pavio, U.L. Rohde, *Microwave Circuit Design Using Linear and Non Linear Techniques*, Springer-Verlag, 1989.  
 Guillermo Gonzalez, *Microwave Transistor Amplifiers Analysis and Design*, Prentice Hall, 1997.

**11. According to Law 51**

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

**12. Contribution of Course to meeting the requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
			√

**12. Course Outcomes**

**MAP to ABET Outcomes**

➤ Describe the importance and necessity of microwave systems and circuits.	d, g, j
➤ Analyse active microwave components (amplifier)	a, e
➤ Analyze passive microwave components (filters, dividers, couplers)	a, e
➤ Analyze and derive S-parameters for different components.	a, e
➤ Use of state of the art CAD tools for simulation of microwave active and passive components	k

Person who prepared this description and date of preparation: Electromagnetic Committee, March, 12, 2008. Submitted by: Dr. Rafael Rodríguez, Committee Coordinator, March, 12, 2008