University of Wisconsin - Madison  
College of Engineering [EGR]  
Last Offered: 2013-2014 Spring [1144]  
Direct Link to this Syllabus:  

1. E C E 545, Advanced Microwave Measurements for Communications  
2. Credits: 3  Contact Hours: 2.5  
3. Textbook and Materials:  


a. Other Supplemental Materials: None

- Specific Course Information:

a. Brief description of the content of the course (Course Catalog Description):  
Measurements at VHF and microwave frequencies; characteristics of microwave generators, amplifiers, passive devices and detection systems; measurement of frequency, noise and simple antenna patterns; time domain reflectometry, swept frequency network and spectrum analyzer techniques; lecture and lab.

b. Pre-requisites or Co-requisites: ECE 301, ECE 444 or cons inst  
c. This is a Selected Elective course.

- Specific Goals for the Course:

a. Course Outcomes:

1. Students in this course gain the ability to perform measurements on RF and microwave devices and characterize the devices.
2. Weekly laboratories cover power measurements, time-domain reflectometry, impedance matching, use of spectrum and network analyzers, circuit fabrication skills, device (i.e., transistor and diode) characterization and use of waveguide.
**ABET Student Learning Outcomes:**

(a) Ability to apply mathematics, science and engineering principles.
(b) Ability to design and conduct experiments, analyze and interpret data.
(c) Ability to design a system, component, or process to meet desired needs.
(e) Ability to identify, formulate and solve engineering problems.
(g) Ability to communicate effectively.
(j) Knowledge of contemporary issues.
(k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

**Brief List of Topics to be Covered:**

1. Signal sources
2. The precision rotating vane attenuator and square law characteristics of a crystal detector
3. Standing wave ratio measurements and impedance matching at microwave frequencies
4. Attenuation measurement and the characteristics of several microwave waveguide junctions
5. Time domain reflectometer
6. Network analyzer
7. Amplifier gain and noise figure measurements
8. Measurements on superheterodyne receiver
9. Transistor scattering parameters using network analyzer to characterize active devices
10. Resonant cavity equivalent circuits using network analyzer to characterize resonators
11. Computer aided design