University of Wisconsin - Madison
College of Engineering [EGR]
Last Offered: 2015-2016 Fall [1162]
Direct Link to this Syllabus:

1. E C E 436, Communication Systems I
2. Credits: 3  Contact Hours: 2.5
3. Textbook and Materials: Communication Systems Engineering; Proakis and Salehi; 2nd; 2002

a. Other Supplemental Materials: None

• Specific Course Information:

a. Brief description of the content of the course (Course Catalog Description):

b. Pre-requisites or Co-requisites: ECE 331

c. This is a Selected Elective course.

• Specific Goals for the Course:

a. Course Outcomes:

1. Understand the application of linear system theory to the implementation of analog communication systems.

2. Produced system-level designs for modulators and demodulators for AM-Large Carrier, DSB (double sideband), 2-channel multiplexed DSB, SSB (single sideband), and FM (frequency modulation).

3. Understand the design tradeoffs for the aforementioned modulation schemes with respect to bandwidth and noise immunity.
• **ABET Student Learning Outcomes**: 

(a) Ability to apply mathematics, science and engineering principles.  
(c) Ability to design a system, component, or process to meet desired needs.  
(e) Ability to identify, formulate and solve engineering problems.  
(i) Recognition of the need for and an ability to engage in life-long learning.  
(k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

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

1. Linear system theory, continuous and discrete time, in both the time and frequency domain, with emphasis of the Fourier transform in both continuous and discrete time and the properties of the Fourier transform.  
2. The analytic signal as a complex-valued signal with a 1-sided Fourier transform.  
3. The Sampling Theorem, with application of sampling to demodulation.  
4. The narrowband representation of signals as a generalization of the phasor representation of the AC-steady state from circuit theory, relation of the narrowband representation to the analytic signal.  
5. Modulation and demodulation of AM-large carrier, DSP, 2-channel multiplexed DSB, SSB, and FM.  
6. Spectrum of FM signals, FM deviation, modulation index, and approximations applicable to narrowband and wideband FM.  
7. Properties of noise in linear systems.  
8. Noise performance of AM, DSB, and SSB.  
10. Design tradeoffs in PLL (phase-locked loop) FM demodulation.