University of Wisconsin - Madison
College of Engineering [EGR]
Last Offered: 2011-2012 Spring [1124]
Direct Link to this Syllabus :
http://aefis.wisc.edu/index.cfm/page/CourseAdmin.ViewABET?coursecatalogid=961&pdf=True

1. E C E 438, Communication Systems Laboratory I
2. Credits : 1  Contact Hours : 3.0
3. Textbook and Materials :
   
   ECE 438 Lab Manual

   a. Other Supplemental Materials : None

   • Specific Course Information :

   a. Brief description of the content of the course (Course Catalog Description) :
      Experiments in basic analog and digital modulation techniques, including amplitude modulation; frequency modulation; single side-band/quadrature modulation; eye patterns; noisy channels; amplitude, phase, and frequency shift keying.

   b. Pre-requisites or Co-requisites : ECE 271; ECE 436 or con reg or cons inst

   c. This is a Selected Elective course.

   • Specific Goals for the Course :

   a. Course Outcomes :

      1. Implement analog communication systems for AM-large carrier, single and double channel multiplexed DSB (double sideband), FM, and SSB (single sideband) by connecting hardware modules for analog multipliers, filters, and VCOs (voltage-controlled oscillators).

      2. Implement baseband digital communications encoders, baseband digital decoders, and pass band encoders and decoders by connection analog hardware modules.

      3. Test baseband encoders for inter symbol interference. Test baseband and pass band
decoders for symbol error rate in the presence of noise.

- **ABET Student Learning Outcomes**:
  
  (a) Ability to apply mathematics, science and engineering principles.
  (b) Ability to design and conduct experiments, analyze and interpret data.
  (e) Ability to identify, formulate and solve engineering problems.
  (g) Ability to communicate effectively.
  (i) Recognition of the need for and an ability to engage in life-long learning.
  (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. AM-LC (amplitude modulation-large carrier) modulation, synchronous and envelope demodulation, characterizing carrier, sidebands, and power using a software spectrum analyzer.
  2. DSB (double sideband) modulation, Costas-loop demodulator, multiplexing a pair of baseband signals on one DSB channel.
  3. FM (frequency modulation) modulation, characterizing sideband structure observed with spectrum analyzer and how it varies with frequency deviation using Bessel functions, PLL (phase-locked loop) demodulator, noise and FM threshold.
  4. SSB (single sideband) modulation and demodulation and discrimination of upper and lower sidebands using the Hartley modulator/demodulator employing quadrature phase-shifting filters.
  5. Baseband digital communications using symbol waveforms, quantification of intersymbol interference using eye diagrams.
  6. Baseband digital communications in the presence of noise, effect of different receiver filters and noise level on bit error rate.
  7. Pass band communications on a carrier frequency using amplitude, phase, and frequency-shift keying, PLL (phase-locked loop) decoding of frequency-shift keying.