ECE 403/405 - Fall 2011
Communication Systems
Instructor: Guillermo Atkin

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Office Hours: M and W: 5:30 to 7:00 PM or by appointment
Class Hours: M and W: 11:25 to 12:40 PM, SB - 238


References:

Course Description: Amplitude and frequency modulation systems. The sampling theorem. Time and Frequency division multiplexing; spectral design considerations. Introduction to information theory. Digital source encoding, quantization, waveshaping and intersymbol interference. Analysis and design of digital modulators and detectors. Probability of error analysis. Channel capacity; block and convolutional codes (3-0-3).

Prerequisites:
- ECE 308, ECE 475 OR MATH 475 (Probabilities)
- Understanding of signals and systems (continuous and discrete).
- Integral and differential calculus
- Basic probability theory

Course Objectives:
- Understanding of analog communication systems
- Determine the minimum sampling rate, bit-rate, and bandwidth needed for a digital communication system
- Understanding of digital communication systems
- Understanding of block and convolutional codes
- Performance of digital communication systems, uncoded/coded
Course Outline:

**Introduction** (Chapters 1, 2 and 5)
- Overview of a Communication System
- Signals and Linear Systems
- Random Variable and Processes

**Analog Signal Transmission and Reception** (Chapters 3, 4 and 6)
- Amplitude and Angle Modulation
- Effect of Noise in Analog Communication Systems

**Information Sources and Source Coding** (Chapter 7 and 12)
- Modeling of Information Sources
- Source Coding Theorem and Algorithms
- Quantization
- Waveform Coding

**Digital Transmission through an Additive Gaussian Noise Channel** (Chapter 8 and 10)
- Pulse Amplitude Modulation
- Two-dimensional and Multi-dimensional Formats
- Signal waveforms
- Optimum Receiver
- Probability of Error

**Channel Capacity and Coding** (Chapter 13)
- Channel Capacity
- Linear Block Codes
- Convolutional Codes

Grading.

- Coursework will be graded as follows:
  - Homework 10% (every week, due Mondays)
  - Project/Exam 1 15%/25% (dates TBA)
  - Exams 2 30% (date TBA)
  - Final exam 20% (TBA)

**Grade Policy:** A (≥ 90%); B(80 - 89%); C(66 - 79%); D(50 - 65%)

HW should be submitted at the beginning of the class on Mondays (hard copies) or using the Digital Dropbox (Blackboard) for MC students and on Wednesdays 5:00 PM for all other sections (only soft copies). Homework solutions will be posted in the Blackboard on Thursdays. No late HW will be accepted without previous instructor consent.