ECE 403/405 – Tentative Syllabus - Fall 2014
Communication Systems
Instructor: Guillermo Atkin

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Office Hours: M and W: TBA
Class Hours: M and W: TBA
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Office Hours:

Text: Communication Systems Engineering (2nd Edition) by John G. Proakis, Masoud Salehi, Prentice Hall, 2002

References:

- Contemporary Communication Systems using Matlab and Simulink, John Proakis, Masoud Salehi, Gerhard Bauch; Thomson 2004.
- Fundamentals of Communication Systems, by J. G. Proakis and M. Salehi, Pearson Prentice Hall, 2005 (or latest edition).
- Digital Modulation and Coding by Stephen G. Wilson, Prentice Hall, 1996.
- Modern Digital and Analog Comm. Systems, B.P. Lathi, Oxford Univ Press, 1998
- L.W. Couch, *Digital and Analog Communication Systems*, 7th Edition, Prentice Hall, 2007
- Error Control Coding, by Shu Lin and Daniel J. Costello, Jr., Prentice Hall, second edition, 2004.

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

- Overview of a Communication System
- Signals and Linear Systems
- Random Variable and Processes

Analog Signal Transmission and Reception

- Amplitude and Angle Modulation
- Effect of Noise in Analog Communication Systems

Information Sources and Source Coding

- Modeling of Information Sources
- Source Coding Theorem and Algorithms
- Quantization
- Waveform Coding

Digital Transmission through an Additive Gaussian Noise Channel

- Pulse Amplitude Modulation
- Two-dimensional and Multi-dimensional Formats
- Signal waveforms
- Optimum Receiver
- Probability of Error

Channel Capacity and Coding

- Channel Capacity
- Linear Block Codes
- Convolutional Codes

Grading.

- Coursework will be graded as follows:
- Homework TBA
- Project/Exam 1 TBA
- Exams 2 TBA
- Project TBA
- Final exam TBA

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

HW should be submitted using the Digital Dropbox (Blackboard) before the beginning of the class on Mondays before the class (only soft copies). Homework solutions will be posted in the Blackboard on Fridays. No late HW will be accepted without previous instructor consent.