

ELE 551 Communication Systems

Fall 2010

Department of Electrical Engineering and Computer Science
Syracuse University

Instructor:

Prof. Yingbin Liang

Email: yliang06@syr.edu

Office: CST 4-189

Basic Information:

Lecture Time: TuTh 2:00pm - 3:20pm

Lecture Room: 103 Link

Office Hour: Tuesday and Wednesday 10:30am-noon, or by email appointment

Course Web: <http://yliang06.mysite.syr.edu/ELE551.html>

Teaching Assistant: Fangrong Peng, Email: fapeng@syr.edu, Office hour: TBD

Prerequisite:

ELE 351 System and Signal Analysis

Basic Matlab skills (recommended)

Textbook:

B. P. Lathi and Z. Ding, *Modern Digital and Analog Communication Systems, 4th Edition*, Oxford University Press, 2009.

Additional Reading:

S. Haykin and M. Moher, *Communication Systems, 5th Edition*, Wiley, 2009.

J. G. Proakis and M. Salehi, *Communication Systems Engineering, 2nd Edition*, Prentice-Hall, 2002.

Requirements and Grading:

Regular homework problems sets (20%). Homework problems will be assigned most weeks and will be due at the **beginning** of class. Late hand-in will not be graded. Solutions will be posted on the web.

Midterm exam I (25%). Tentatively scheduled on the second week of October.

Midterm exam II (25%). Tentatively scheduled on the second week of November.

Final exam (30%).

Course Objectives and Outcomes:

The general goal of this course is to apply the mathematical tools introduced in this course to understand and design analog communication systems. Each student is expected, at the end of the semester, to understand concepts and design principles of analog communication systems thoroughly, and to be able to use of mathematics (probability, calculus, linear algebra) to study and enhance performance of communication systems, and to have introductory understanding of digital communications. Upon completion of this course, each student should be equipped with skills to apply knowledge of mathematics to design and analyze communication systems to meet certain technological specifications.

This course contributes to ABET objectives (a) (c) (e) (o) and (p).

Course Outline:

Review of Signals and Linear Systems [Chapters 1-3]

- Introduction to communication systems
- Basics of signals, signal operations
- Dirac function and linear systems
- Fourier series, Fourier transforms, frequency analysis
- Signal energy and power

Analog Modulations and Demodulations [Chapters 4, 5]

- Amplitude modulations and demodulations - DSB-SC; AM; Bandwidth efficient modulations; Demodulations
- Angle modulations and demodulations - FM and PM; Carson's rule; Generation and demodulation of FM

Probability and Random Processes [Chapters 8, 9]

- Random variable and random process
- Autocorrelation and power spectral density
- Random processes passing through linear filter
- Gaussian random variable and process
- White (Gaussian) noise

Noise in Analog Systems [Chapter 10]

- Signal-to-noise ratio (SNR) analysis for different modulation schemes

Digital Communications [Chapters 6, 7]

- Sampling and quantization
- Pulse code modulation (PCM) system
- Baseband binary transmission and its error probability calculation