

EEE 260 STATISTICAL THEORY OF COMMUNICATION

Required Course (Either EEE 260 or EEE 211)

Date: May 24, 2007

Course Area: Communications

Course Coordinator: Warren D. Smith, EEE.

Catalog Description: EEE 260. Statistical Theory of Communication. Review of Fourier analysis and theory of probability, random processes, optimum filtering, performance of analog and digital communication systems in the presence of noise, system optimization. Prerequisite: EEE 185. 3 units.

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Text: Lathi, B. P., Modern Digital and Analog Communication Systems, 3rd Ed., Oxford University Press, 1998.

Additional Resources:

Course Objectives: After reviewing Fourier analysis and probability theory, students will learn to work with random process models of communication signals and noise in the time and frequency domains. Students will use these models to analyze the performance of analog and digital communication systems in the presence of noise and to design optimum filtering and systems.

Prerequisites by Topic:

1. Measures of signal strength and correlation
2. Signal spectra by Fourier series and Fourier transform analysis
3. Time and transform domain methods of system analysis, including transfer functions
4. Introductory probability and statistics
5. Analog and digital communication systems
6. Methods of modulation and demodulation in communication systems

Topics Covered:

1. Review of signal spectra by Fourier series and Fourier transform analysis
2. Review of probability and statistics
3. Random processes
4. Optimum threshold detection
5. Carrier systems for digital communication: ASK, FSK, PSK, DPSK
6. Spread spectrum systems
7. M-ary communication
8. Baseband and amplitude-, angle-, and pulse-modulated analog systems

Evaluation: Student performance in this course will be evaluated on the basis of three exams (65%), a project (25%), and homework (10%). Typical projects include designing and using MATLAB to demonstrate and analyze the performance of matched, Wiener, and Kalman filters.

Course Outline/Schedule

<i>Week</i>	<i>Topic</i>	<i>Text Reference</i>
1	Review of Fourier series and Fourier transform Review of probability	434-449
2	Review of random variables Review of probability density functions/cumulative distribution functions	449-463
3	Review of univariate and bivariate distributions Review of expected values	463-486
4	Review of central limit theorem. Review of correlation Exam #1 (50 points)	
5	Random processes Power spectral density of a random process	487-509
6	Multiple random processes Random processes through linear systems	509-519
7	Bandpass random processes Optimal filtering	519-531
8	Review Exam #2 (100 points)	
9	Optimum threshold detection: binary case Suboptimal filters/optimum binary receiver	577-589
10	Carrier systems: ASK, FSK, PSK, DPSK Coherent detection/noncoherent detection	590-608
11	Spread spectrum systems M-ary communication/synchronization	608-625
12	Review Exam #3 (100 points)	
13	Baseband systems/amplitude-modulated systems	532-541
14	Angle-modulated systems	541-557
15	Pulse-modulated systems	557-576
	Project presentations (100 points)	