EE 562a Random Processes in Engineering Fall 2007

Lecture: MW 5-6:20 pm, RTH 109

Discussion: Wed 1-1:50 pm, OHE 100D

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Office hours Tu 3-5 pm, Wed 2-4 pm

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Office hours Tues and Thu 4-5 pm, EEB 405

Reading: Supplemental course notes on DEN website;
recommended text *Probability and Random Processes,*
Stark and Woods

Firm Prerequisites:

1. Linear Algebra, matrix theory, linear spaces, bases, eigenvectors, eigenvalues, etc. (EE 441 or pass placement exam)
2. Probability theory and random variables, moments, transformations of random variables, characteristic functions and moment generating functions, etc. (EE 464 or pass placement exam)
3. Fourier, Laplace and z transforms, complex variables, contour integrals and residues (EE 401 or equivalent)

Homework: Approximately 8 problem sets

Midterm exam: Wed 17 October 2007 during regular class hours

Final exam: 4:30-6:30 pm, Wed 12 Dec 2007

Grading policy: Homework 10%
Midterm 35%
Final 55%

Topics:

This is a first course in random processes for engineers, and is a prerequisite for many courses in communications, controls and signal processing.

1. Definition of random processes; random variables, random vectors, random sequences, random waveforms, etc.
2. Second order statistics: properties of correlation functions.
3. Covariance matrix factorization, eigenvalues, eigenvectors, causal factoring and whitening concepts.
4. Simple hypothesis tests.
5. Linear minimum mean square estimation, orthogonality principle.
6. Gaussian processes.
   (Midterm on the above material.)
7. Linear operations, convergence concepts: convolution, integration, differentiation.
8. Time averages, stationarity, ergodicity.
9. Frequency domain analysis: time-invariant linear operations.
10. Energy spectra, power spectra, white noise approximations.
11. Linear transformations of wide-sense stationary random processes, spectral factorization, and applications.
12. Karhuenen-Loeve expansions on finite intervals.
13. *Time permitting:* Poisson distributed events in time, Campbell's theorem; narrowband representations.

(Final covers whole course, but with emphasis on topics 7-12.)