ECE-1330: Noise and Stochastic Processes
Winter Quarter 2003 Course Syllabus

Basic Information

Course	: ECE 1330 - Noise and Stochastic Processes
Quarter	: Winter 2003
Meetings	: Tue, Wed, Fri 11:45 am - 12:50 pm
Classroom	: 153 Ryder, Northeastern University Boston Campus
Instructor	: Prof. A. Bruce McDonald (**mcdonald@ece.neu.edu**)
Office Hrs	: Tue 3:00 pm - 5:00 pm (or by appointment)
Office	: **417 Dana**
Phone	: **373-3028**
WWW Site	: Please see course web site for information
Teaching Assistant	: Mazen Kachmar
TA Contact Info	: email: **mazenkachmar@hotmail.com**

Course Description

The primary objective of this course is to provide students with a basic understanding of random models and their importance in engineering applications. Many practical systems could not be developed without understanding the impact and degree of uncertainty in the system's input(s) and response. Hence, it is crucial for students to gain both an appreciation for the role of random processes, and, an understanding of the techniques used to model them. A partial list of topics in Electrical Engineering that rely heavily on random models include: Communications Systems, Digital Communications, Wireless Communications, Communications Networks and Signal Processing. This course is intended to provide students with the tools to apply random models in each of the aforementioned disciplines. This course introduces probability and random variables in order to characterize signals in the presence of noise—topics covered include: conceptual and axiomatic definitions of probability, discrete and continuous random variables, the probability density function (PDF), the cumulative distribution function (CDF), and the probability mass function (PMF), expectation and other functions of random variables, conditional probability and independence, Markov and Chebyshev inequalities, multiple random variables, introduction to random processes, correlation, covariance and stationarity. Finally, students are introduced the Fourier Transform and its application with respect to Power Spectral Density—leading to the concept of white and colored noise, power spectrum estimation and signal detection.

Course Material

The required textbook is: "Probability, Random Signals and Statistics" by X. Rong Li, published by CRC Press, 1999. Lecture note templates consist of view-graphs from the text that will be down-loadable from the course web site—students are advised to print the view-graphs and bring them to class to avoid excess copying of notes. In addition, honors students are required to read supplementary material to be provided by the instructure in discrete event simulation and will be required to develop and validate simulation models of simple 'queueing systems' using the simulation system **Opnet** by *Mil-3* available on the ECE systems.

Course Schedule

Class meets three times each week for approximately one hour (11:45 - 12:50) in 153 Ryder. The following schedule indicates the source of material covered in each lecture based upon chapter number in the X. Rong Li text; you should plan your readings accordingly—the specific sections covered each day will vary and there may be some deviation from this schedule. The due dates for each homework assignment are as indicated; each assignment will be given out on the previous Friday [1].

Week #1	January 3	:	Introduction	(Very brief week indeed !)
Week #2	January 7	:	Chapter-2	Brief entrance quiz—not graded!
	January 8	:	Chapter-2	
	January 10	:	Chapter-2	HW #1 Due (Final day to register)
Week #3	January 14	:	Chapter-2	
	January 15	:	Chapter-3	
	January 17	:	Chapter-3	HW #2 Due (Final day to drop without 'W')
Week #4	January 21	:	Chapter-3	At Conference—substitute
	January 22	:	Chapter-3	At Conference—substitute
	January 24	:	Chapter-3	HW #3 Due
Week #5	January 28	:	Chapter-3	
	January 29	:	Chapter-3	
	January 31	:	Chapter-4	HW #4 Due
Week #6	February 4	:	Chapter-4	
	February 5	:	Chapter-4	
	February 7	:	Midterm	Covers Chapters 1,2 and 3 (maybe some 4)
Week #7	February 11	:	Chapter-4	
	February 12	:	Chapter-4	
	February 14	:	Chapter-4	HW #5 Due (Midterms returned)
Week #8	February 18	:	Chapter-6	
	February 19	:	Chapter-6	
	February 21	:	Chapter-6	HW #6 Due (Final day to drop class)
Week #9	February 25	:	Chapter-6	
	February 26	:	Chapter-6	
	February 28	:	Chapter-6	HW #7 Due
Week #10	March 4	:	Chapter-7	
	March 5	:	Chapter-7	
	March 7	:	Chapter-7	HW #8 Due
Exam Week	Final Exam	:		Covers Chapters 1,2,3,4,6 and 7 (parts)

During the weeks of the midterm exam and the final exam the TA will offer two optional 'problem sessions' where he will cover questions related to the home-works and present a few additional examples relevant to the upcoming examination(s). The times and places will be announced during the preceeding week.

[1] Note to students: please observe the minor changes to the schedule reflecting the addition of required material from Chapter-7 of the course text.

Course Evaluation

Course evaluation shall consist of eight (8) graded homework assignments, a one-hour midterm exam and the final examination. The weight given to each of these components with respect to the overall course grade is indicated below. A linear grading scale will be used to convert raw scores into letter grades; to earn the grade of 'A' the student must demonstrate mastery of the material and consistency of effort. A grade of 'B' or better indicates very good to excellent performance—there are no pre-determined bounds on the number of any given grade; each student will receive the grade he or she earns.

Home-works	: 30%
Midterm Exam	: 30%
Final Exam	: 40%

Honors Program: Students enrolled in the honors program who wish to register for a one-credit honors adjunct for this course must see me and sign up before the end of the second week of class. The adjunct carries a separate grade from the base course and requires additional work and interaction with the instructor. The honors simulation project is described separately and carries a grade that is distinct from the base course.

Course Policies

- Students are expected to complete all the course assignments and master the course material; class attendance is not mandatory, however, it is highly recommended.
- Students are expected to come to class prepared; as such you are expected to read the material associated with each lecture prior to the lecture.
- Homework assignments must be turned in on-time to receive credit; late home-works will not be accepted—assignments are to be submitted at the start of class on the due date.
- Homework assignments must be neat and legible with all steps and parts clearly identified; use standard $8\frac{1}{2}$ x 11 in. paper with problems in order and pages stapled together (typeset is preferred, but not required).
- All students must be present for and take the midterm and final exams at the scheduled dates and times; exceptions will be given for verifiable emergencies, or under extreme circumstances and, then, only if permission is granted by the instructor in advance of the date of the exam.
- Students are expected to adhere to University academic integrity policy; students are encouraged to work together on homework assignments, however, copying from another and presenting it as your work is a fraudulent act—any student who violates this policy will receive a grade of 'F' for the course.
- Questions regarding grading are to be directed as follows: For homework queries contact the TA. If a dispute cannot be resolved, please setup an appointment to see me via email; for midterm related queries please setup an appointment to see me via email; for final grades please send email to me *after* the start of Spring Quarter in order to schedule an appointment.
- Please feel free to discuss with me any problems you are having with the class—I appreciate any feedback that you have that can improve the course now or in the future.