**EECS 501**  
**PROBABILITY AND RANDOM PROCESSES**  
**Fall 2003**

**Synopsis**

The goal of this course is to learn how to work with probabilistic models of random experiments, as needed for example in graduate classes in communications and signal processing. The course covers several ways of describing such experiments (probability models, random variables, random vectors and random processes) and several ways of describing their probability distribution (probability measures; distribution, mass and density functions). Much of the course is concerned with how to compute various probabilistic quantities (e.g. event probabilities, expected values, correlations, best estimates, frequency spectra) from other probabilistic quantities (e.g. density functions). The course topics are similar to those typically covered in a senior level course on this topic, such as EECS 401, but a deeper level of understanding is expected and more attention is paid to mathematical formulation.

**Course Details**

**Lecture Section 1**  
Room & Time: MWF 8:30-9:30, 1311 EECS Bldg.  
Credit hours: 4  
Prerequisite: EECS 401 or graduate standing  
Recitations: One session, 1.5 to 2 hrs per week.  
There are presently three recitation times 3:30 M, 9:30 W, 3:30 W, and we may add a fourth. We are going to try to reschedule the Wednesday recitation sessions to Monday and Tuesday.

Faculty  
Instructor: Prof. David L. Neuhoff, 4215 EECS Bldg.  
euhoff@umich.edu, 764-6586

Office hours: times to be announced (TBA, see class website)  
Or by appointment: stop by, call, or send email to schedule an appointment.

Graduate Student  
Instructors: Office hours: In Room 2420 EECS, the usual room for GSI office hours, TBA (see class website)  
Or by appointment: call or send email

**Text:**  
*Probability and Random Processes for Electrical Engineers*, by John Gubner.  
This book is not yet published. Registered students or students who have been given permission to register may pickup a copy (at no cost) from Ms. Ann Pace in Room 4230. Chapter 1 is posted on the class website.

**Rough Syllabus:**

Probability models and axioms: Chapter 1 of Gubner  
Random Variables: Chapters 2-4, 6, and selections from Chapters 8, 11 and 12.  
Estimation/decision theory: Section 8.4  
Random processes: Sections 7.1-7.5 and possibly selections from Chapters 9 and 10.  
Additional material will be presented in lecture. Taking notes is important.

**First reading assignment:**  
Chapter 1 of Gubner

**References:**  
Other textbooks at a similar level:  
P. Bremaud, *An Introduction to Probabilistic Modeling*  
W. Davenport, *Probability and Random Processes*  
R. Gray and L. Davisson, *Random Processes*  
R. M. Gray and L. D. Davisson, *An Introduction to Statistical Signal Processing* is available
for free download at: www-ee.stanford.edu/~gray/sp.html
G. Grimmett and D. Stirzaker, *Probability and Random Processes*
A. Papoulis, *Probability Random Variables and Stochastic Processes*,
B. Picinbono, *Random Signals and Systems.*
M. Pursley, *Random Processes in Linear Systems*
S. Ross, *A First Course in Probability*
D. Sakrison, *Communication Theory* (Chapters 3 and 4)
H. Stark and J. Woods, *Probability Random Processes and Estimation Theory for Engineers*

Senior level textbooks:
A. Drake, *Fundamentals of Applied Probability*
C. Helstrom, *Probability and Stochastic Processes for Engineers*
A. Leon-Garcia, *Probability and Random Processes for Electrical Engineering*
R. Roberts, *An Introduction to Applied Probability*
J. Thomas, *Introduction to Probability*

Homework: With a few exceptions, homework will be assigned every week. Homework is important, and will be counted enough towards the course grade that you take it seriously, but not so much that you cannot afford to make mistakes.

Usually, homework will be posted on the class website on Friday and due the next Friday in class. However, as an extended deadline, homework may also be placed in the collection box in Room 4230 by 3:30 PM on the due date. Late homework will not be accepted, except in extenuating circumstances such as serious illness.

Homework will typically be graded and returned one week later. Solutions will be posted to the class website. If you have questions about the grading, see Prof. Neuhoff or one of the GSI's.

Notes: Homework must be turned in in one of the two ways mentioned above. Do not leave it in a mailbox. And do not interrupt a lecture to turn in your homework.

Collaboration policy: All homework assignments are to be completed on your own. You are allowed to consult with other students during the conceptualization of a solution, but all written work, whether in scrap or final form, is to be generated by you working alone. You are also not allowed to use, or in any way derive advantage from, the existence of solutions prepared in prior years.

Violation of this policy is an honor code violation, subject to the honor code penalties. New students to UM Engineering should familiarize themselves with the Engineering Honor Code. If you have any questions about this policy, please do not hesitate to contact Prof. Neuhoff.

Exams: Two 2-hour evening midterms will be given at dates to be announced.
Final Exam: Tues. Dec. 16, 10:30-12:30.

Grade basis: Homework 15% (lowest homework grade will be dropped)
Midterm I 25%, Midterm II 25%, Final Exam 35%.

E-mail Announcements (e.g. announcements of homework assignments, homework problem hints and corrections, exam schedules, etc.) will be emailed to the class. You must register for the class email list this week by sending email to eecs501-request@eecs.umich.edu with the word "subscribe" in the subject line. You should receive an email confirmation. Also one or more test emails will be sent to this email list and announced in class. Let Prof. Neuhoff know if you do not receive them. (Sometimes people attempting to enroll from nonuniversity accounts encounter difficulties.)

Course web www.eecs.umich.edu/courses/eecs501/eecs501. Homework assignments, solutions and most class handouts, such as this one, will be posted on the website, as well as various announcements. such as a listing of office hours.

Makeup Professor Neuhoff will be out of town attending conferences on Sept. 15, 17, 29 and Oct. 1.
Lectures: We will either have substitute lecturers or evening makeup lectures.