EE 640 **Stochastic Systems**
Tuesdays and Thursdays from 11:00 am to 12:15 am, RMB 323
Spring 2007

Instructor: Dr. Qi (Bob) Hao **Office hours**: 1:00pm-2:30pm TTr.
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URL: http://www.engr.uky.edu/~lgh/classes/classes.htm
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Textbook: *Random Signals Detection, Estimation and Data Analysis*
K. Sam Shannugan and A. M. Breipohl. ISBN 0-471-81555-1

Class Content and Objective:
The content of "Stochastic Systems" represents the basic knowledge necessary for signal processing and pattern recognition applications. Chapters 1 through 4 will be covered with possibility of specific material from chapters 6. There are three areas covered in this course, both as lectures and projects:

1. Random Noise analysis and synthesis: We will cover the concepts of probability, random variables, random vectors and functions of multiple random variables. Specific concepts include Conditional probability, Bayes theorem, expectations and functions of random variables. Theoretical issues such as bounds and convergence definitions will be included. Practical applications in signal and image processing will be given as part of the project 1 problems.
2. Random Processes: We will cover the concepts of random processes, autocorrelation, linear operation on random processes and sampling. Project 2 will cover the concepts and applications of random process theory.
3. Stochastic signal processing: The types of random process models will be detailed and emphasis will be placed on signal detection and discrimination for 1-D and 2-D functions. Optimal signal processing architectures will be developed and analyzed. Matched and Wiener Filters will also be covered.

There will be three educational components to the course which include lecture, home work and MATLAB projects. The lectures will be designed to provide theoretical basis and design equations. The homework will include problems from the text as well as computer problems which will give the students immediate inter-action with the theory and design aspects of Stochastic systems. The MATLAB projects will provide the students with individual depth yet experience with a team effort. The student should attain a good theoretical and practical understanding of stochastic systems.

Grading Policy:

Homework:	20% (Once a week, Due one week after assignment. Some homework may be due in parts, such as a single problem due the next lecture session. No late homework, drop the lowest 1).
Computer Project 1a:	10%. Synthesis, analysis and parameter estimation of random variables.
Midterm Exam:	25% (Date to be announced, open book, open notes).
Computer Project 1b:	10%. Synthesis, sampling, analysis, function estimation.
Computer Project 1c:	10%. Detection theory with random processes.
Final Exam:	25% (Tuesday 5-1-07, 10:30am to 12:30pm, open book, open notes).

Reference:
Probability, Random Processes and Estimation Theory for Engineers, by Henry Stark and John W. Woods.
Introductory Probability and Statistical Applications, by P. L. Meyer.
Probability and Statistics, by M. H. DeGroot.
Discrete-Time Signal Processing, by Oppenheim and Schafer.
Pattern Classification and Scene Analysis, by Duda & Hart.
Detection: Estimation, and Modulation Theory: Part I, by Harry L. Van Trees.
Linear Statistical Inference and Its Applications: 2nd Edition, by C. R. Rao.
Probability, Random Variables, and Stochastic Processes, 2nd and 3rd Editions, by A. Papoulis.
Numerical Recipes in C, by Press, Flannery, Teukolsky and Vetterling.

This syllabus subject to change during the semester.