36-703 INTERMEDIATE PROBABILITY COURSE DESCRIPTION AND SYLLABUS SPRING 2006

Class Schedule:	TR 12-1:20 in Scaife Hall 208	Vital Info
Instructor:	Christopher Genovese	
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Office Hours:	TBA and by appointment	
TA:	Charles Lee (charlesl@stat.cmu.edu)	
Office Hours:	TBA and by appointment	
Home Page:	http://www.stat.cmu.edu/~genovese/iprob/	
Text:	Probability and Random Processes, Third Edition	
	by Grimmett, G.R. and Stirzaker, D.R.	
(supplemental)	Elements of Information Theory	
	by Cover, T. and Thomas, J.	
	plus notes and supplementary readings.	

The goals of this course are (i) to give you experience building probability models with stochastic processes; (ii) to study in depth a range of important stochastic processes; and (iii) to prepare you mathematically for work in advanced probability theory. **Course Objectives**

By the end of this course, you will be able to

- build, validate, and analyze models based on standard stochastic processes, including Markov Processes, Martingales, and diffusions;
- employ arguments and techniques from related areas including information theory, stochastic calculus, and empirical process theory; and
- prove rigorously a variety of important probabilistic results.

Scope We will take a practical approach to probability theory with a focus on building models you can use and understanding them mathematically. Rigorous proofs in probability theory (as emphasized in 36-754, Advanced Probability) depend in large part on measure theoretic arguments but often differ from what we will cover only in details and regularity conditions. We will cover some of this mathematical infrastructure but will not emphasize the measure theory. The topics I plan to cover include the following: 0. (Spicy) Review of Probability Theory 1. Fun with White Noise 2. Markov Processes and their generalizations 3. Martingales 4. Brownian Motion 5. Ergodic Theory and Stationary Processes 6. Information Theory, Coding, and Communication 7. State-Space Models and Kalman Filtering 8. Statistical Inference and Basic Empirical Processes 9. Stochastic Calculus We will spend a fair chunk of time on Information Theory and making the connections to stochastic calculus and statistical inference.

I will assign weekly problem sets that cover and extend material we have discussed and that introduce upcoming ideas. There will be a midterm and a final, and possibly an extra exam during the term if it seems warranted.

Grading:

30%	Homework
30%	Exams during the term
30%	Final Exam
10%	Class participation

Logistics