

University of Pennsylvania
Department of Electrical and Systems Engineering
ESE 301 : Introduction to Probability
Spring 2008, T-Th 3:00-4:30pm, Moore 216

Instructor

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Teaching Assistant

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Prerequisites

Math 114 : Multi-variable calculus

Textbook

Introduction to Probability, by Dimitri P. Bertsekas and John N. Tsitsiklis,
Athena Scientific, 2002.

Textbook (errata,problems,solutions) website : <http://www.athenasc.com/probbook.html>

Another Reference

A first course in probability, by Sheldon Ross, Prentice Hall, Seventh Edition, 2006.

Grading and Tentative Dates

Homework : 25 %
Exam I (Oct 23) : 25 %
Exam II (Dec 4) : 25 %
Final (Finals week) : 25 %

Course Outline

1. Sample Space and Probability

Sets, Probabilistic Models, Conditional Probability, Total Probability Theorem and Bayes' Rule, Independence, Counting.

2. Discrete Random Variables

Basic Concepts, Probability Mass Functions, Functions of Random Variables, Expectation, Mean, and Variance, Joint PMFs of Multiple Random Variables, Conditioning, Independence.

3. General Random Variables

Continuous Random Variables, PDFs, Cumulative Distribution Functions, Normal Random Variables, Conditioning on an Event, Multiple Continuous Random Variables, Derived Distributions.

4. Further Topics on Random Variables

Transforms, Sums of Independent Random Variables, Convolution, Sum of a Random Number of Independent Random Variables, Covariance and Correlation, Least Squares Estimation, The Bivariate Normal Distribution.

5. Stochastic Processes

The Bernoulli Process, The Poisson Process.

6. Markov Chains

Discrete-Time Markov Chains, Classification of States, Steady-State Behavior, Absorption Probabilities, Expected Time to Absorption, Continuous-Time Markov Chains.

7. Limit Theorems

Markov and Chebyshev Inequalities, The Weak Law of Large Numbers, Convergence in Probability, The Central Limit Theorem, The Strong Law of Large Numbers.