

Spring 2004
ECE 331
Introduction to Random Signal Analysis and Statistics

Class meets: 1-2:15 TR, 2317 EH

Goal: Fundamental understanding of the basic principles of probability theory

- **Instructor**

Professor James A. Bucklew
3417 Engineering Hall (Ph:262-3760)
bucklew@engr.wisc.edu
Office hours: by appt.

- **Teaching Assistant**

Gautham Hariharan
4620 Engineering Hall (Ph:265-9355)
gauthamh@cae.wisc.edu
Office hours : Mon:3-4:30 Tue:4-6 Fri:11-12:30

Grader

to be announced.

- **Discussion Section**

6:30-8:00pm Wed, 2535 EH (Teaching Assistant)

- **Required Notes:**

J. Gubner, *Probability and Random Processes for Electrical Engineers*. Available at Bob's copy shop.

- **Grading**

Homework: 10% (or less)
Midterm 1: 45%
Midterm 2: 45% May 6.
NO FINAL EXAM

Tentative Course Outline

1. Chapter 1. Introduction

- 1.1 Review of Set Notation (except * sections)
- 1.2 Probability Models
- 1.3 Axioms of Probability Theory

- 1.4 Conditional Probability
 - 1.5 Independence
2. Chapter 2. Discrete Random Variables
 - 2.1 Probabilities involving random variables
 - 2.2 Expectation
 - 2.3 Probability Generating Functions
 - 2.4 The Binomial Random Variable
 - 2.6 Conditional Probability
 - 2.7 Conditional Expectation
 3. Chapter 3. Continuous Random Variables
 - 3.1 Densities and Probabilities
 - 3.2 Expectation of a Single Random Variable
 - 3.3 Transform Methods
 - 3.4 Expectation of Multiple Random Variables
 4. Chapter 4. Cumulative Distribution Functions and Applications
 - 4.1 Continuous Random Variables
 - 4.2 Discrete Random Variables
 - 4.3 Mixed Random Variables
 - 4.4 Functions of Random Variables and Their Cdf's
 - 4.5 Properties of Cdf's
 5. Chapter 6. Bivariate Random Variables
 - 6.1 Joint and Marginal Probabilities
 - 6.2 Jointly Continuous Random Variables
 - 6.3 Conditional Probability and Expectation
 - 6.4 Bivariate Normal
 - 6.5 Extension to Three or More Random Variables
 6. Chapter 7. Introduction to Random Processes
 - 7.1 Characterization of Random Processes
 - 7.2 Strict-sense and Wide-Sense Stationary (WSS) Processes
 - 7.3 WSS Processes through Linear Time-Invariant (LTI) Systems
 - 7.4 Power Spectral Densities of WSS Processes
 7. Additional Topics (time permitting). Weak Law of Large Numbers, Central Limit Theorem, Markov Chains