ENEE324: Engineering Probability – Course Syllabus

Spring 2009 Instructor: Joseph JaJa

http://www.umiacs.umd.edu/~joseph/classes/enee324/index.htm

Course Objectives: Axioms of probability; conditional probability and Bayes' rule; random variables, probability distribution and densities: functions of random variables: weak law of large numbers and central limit theorem. Introduction to random processes, hypothesis testing, and Markov chains.

Prerequisite: ENEE 322 and completion of all lower-division technical courses in the ECE curriculum

Textbook (required): Yates and Goodman, *Probability and Stochastic Processes* (second edition), Wiley.

Core Topics:

1. *Introduction to Probability (Chapter 1)*
   - Sample Space and Events
   - Axioms of Probability
   - Computing Probabilities
   - Conditional Probability and Independence
   - Sequential Experiments
   - Independent Trials
2. *Random Variables (Chapters 2 and 3)*
   - Discrete Random Variables and Probability Mass Function
   - Continuous Random Variables and Probability Density Function
   - Functions of a Random Variable
   - Expected Value, Variance and Standard Deviation
   - Important Families of Discrete and Continuous Random Variables
   - Conditional Distributions and Conditional Expectations
3. *Multiple Random Variables (Chapters 4 and 5*)*
   - Joint Probability Functions
   - Marginal Probability Functions
   - Functions of Multiple Random Variables
   - Conditional Distributions and Conditional Expectations
   - Covariance and Correlation
   - Independent Random Variables
4. *Sums of Random Variables (Chapter 6*)*
   - Probability Density Function of Sums of Random Variables
   - Moment Generating Functions
   - Central Limit Theorem
5. *Parameter Estimation (Chapter 7*)*
   - Sample Mean and Expected Value
   - Estimates of Model Parameters
   - Weak Law of Large Numbers
   - Confidence Intervals

6. *Hypothesis Testing (Chapter 8*)*
    - Basic Concepts
    - Binary Hypothesis Testing
    - Maximum A Posteriori and Maximum Likelihood Tests
    - Multiple Hypothesis Testing
7. *Stochastic Processes (Chapter 10*)*
    - Types of Stochastic Processes
    - Independent, Identically Distributed Random Sequences
    - Poisson Processes
    - Stationary Processes
8. *Optional: Markov Chains (Chapter 12*)*
    - Discrete Markov Chains
    - Limiting State Probabilities
    - Limit Theorems for Irreducible Finite Markov Chains

Starred chapters are partially covered.

Grading Policy:

- **Midterm Exams: 15% each** (February 26, April 2, April 30)
- **Homework: 20%** (assigned after each lecture, collected by the end of the next lecture, returned in recitations)
- **Final Exam: 35%** (Comprehensive, 10:30-12:30, May 20)

Late Assignments: No late assignments will be accepted but the assignment with the lowest score will not be counted.

Office Hours by Instructor (3433 A.V. Williams Bldg): Tu, Th 1:00 – 2:30 and by email appointment. Additional office hours will be offered by the TAs.

Contact Information: joseph@umiacs.umd.edu; 301-405-1925.

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