

EE 523

Random Processes for Communications and Signal Processing

- **Instructor:** Prof. Aditya Ramamoorthy, Coover 3222, Email: adityar@iastate.edu
- **Class Time:** MWF 12:10-1:00 pm, Coover 1219.
- **Prerequisite:** EE 322 *Probabilistic Methods for Electrical Engineers* (or equivalent).
- **Textbook:** A. Papoulis and S. U. Pillai, *Probability, Random Variables and Stochastic Processes*, 4th edition, McGraw-Hill, 2002.

Course Objectives

This course is intended as a graduate introduction to probability and random processes. It shall give the student the ability to mathematically model stochastic systems and analyze and predict their performance. Graduate students working in communications and signal processing will find it most useful. However students from other areas can also benefit from it if they have required background and interest. Please contact me if you have any specific questions.

Course Outline

1. Basics of probability
 - Axioms of Probability: set theory, probability spaces, conditional probability.
2. Concepts of Random Variables
 - Distribution functions and density functions with examples.
 - Functions of random variables. Discussion about moments, moment generating functions and characteristic functions with applications.
 - Discussion about random vectors and the generalization of the basic concepts for them.
3. Sequences of random variables: Basic concepts of convergence, law of large numbers, central limit theorem.
4. Basic concepts of stochastic processes: definitions, stationarity, cyclo-stationarity, auto-correlation sequences and power spectrum.
5. Important stochastic processes: Random walks, Markov Chains, Gaussian processes and Poisson Processes.
6. Power spectral density, representation and estimation.

7. Selected topics demonstrating specific applications in communications and signal processing.

The course outline is tentative right now. Depending on the composition of the class we may decide to focus on some topics more than others.

Please address any special needs or special accommodations with me at the beginning of the semester or as soon as you become aware of your needs. Those seeking accommodations based on disabilities should obtain a Student Academic Accommodation Request (SAAR) form from the Disability Resources (DR) office (phone 515-294-7220). DR is located on the main floor of the Student Services Building, Room 1076.

Course Policies

- Grading Policy
 1. Homeworks 15%
 2. Two midterms 15% + 15%
 3. Final Exam 40%
 4. Project or term paper 15%
- Homeworks

There will be homework assigned every week and due back the next week. I shall not entertain late submissions except if you have a valid reason. Collaboration on homeworks is fine as long as each person understands and writes the solutions to the homeworks themselves.
- Policy on academic dishonesty

Cheating in exams will not be tolerated. *Please do not do it.* The appropriate authorities at the college level will be notified in cases of academic dishonesty. Procedure regarding academic dishonesty as laid out in the ISU Student Information Handbook available at <http://www.dso.iastate.edu/handbook/toc.htm> will be followed.