Course Description:

Probability and random processes are fundamental to many ECE areas such as communications, signal processing, controls, and computer networks, as well as to other areas such as finance, operations research, physics and biology. This course covers the basic theory and some important applications. While the course is self contained, familiarity with basic probability concepts from STAT 346 is essential. Students will acquire important tools that will be found useful in many disciplines. Non-ECE students are welcome.

Course Outline:

- Sample Space and Probability (Weeks 1-2)
  1. Sets
  2. Probabilistic Models
  3. Conditional Probability
  4. Independence
  5. Total Probability and Bayes Rule
  6. Counting Techniques

- Discrete Random Variables (Weeks 3-4)
  1. Probability Mass Functions
  2. Functions of Random Variables
  3. Expectation, Mean and Variance
  4. Joint PMFs of Multiple Random Variables
  5. Conditional Probability Mass Functions
  6. Independence

- First Test: Feb 23 (1/2 of Week 5)
• General Random Variables (Weeks 5-8)
  1. Continuous Random Variables and Probability Density Functions
  2. Cumulative Distribution Functions
  3. Conditioning on an Event
  4. Joint PDFs and CDFs of Multiple Random Variables
  5. Conditional Probability Density Functions
  6. Mixture of Discrete and Continuous Random Variables
  7. Derived Distributions

• Second Test March 23 (1/2 of Week 9)

• Characteristic Function (Weeks 9-10)
  1. Sums of Independent Random Variables
  2. Second-Order Moments - Covariance and Correlation

• Jointly Gaussian Random Variables (Week 10)

• Conditional Expectation (Week 11)
  1. Minimum Mean Square Estimation
  2. Linear Minimum Mean Square Estimation

• Random Processes (Weeks 11-14)
  1. Gaussian Processes
  2. Bernoulli Processes
  3. Poisson Processes
  4. Markov Chains


Other Reference Books:


Attendance and homework:

1. Students are encouraged to attend all classes and to submit all homework assignments. Problems will be assigned weekly, and will be reviewed in the recitation session.
2. Homework assignments are due in class on Monday following their assignment. Homework will be collected during the break around 8:45-9:00 pm.

3. The book’s homepage contains solutions to all homework problems in the book. Solutions to assigned problems can only be used after you have worked out and submitted your own solutions. You should attempt other problems in the book that were not assigned in class and check yourself using the homepage solutions. Coping solutions for assigned problems constitutes a violation of the university honor code.

**Prerequisite:** STAT 346 or equivalent.

**Communication:**

Announcements, homework assignments, course material, etc, will be emailed to your GMU email address which is on file at the GMU Registrar. If you wish to have your course material delivered to another email address, you may include a .forward command in your GMU directory. Please make sure that your mail box is not full. For each email message that you will be sending me, please write ece528 on the subject line.

**Grading:**

Homework 15%; Best of first two tests 45%; Final 40%