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

- Discrete Random Variables (Meetings 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: June 2 (1/2 of Meeting 5)

- General Random Variables (Meetings 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

- Characteristic Function (Meetings 8-9)
  1. Sums of Independent Random Variables
  2. Second-Order Moments - Covariance and Correlation

- Jointly Gaussian Random Variables (Meeting 9)

- **Second Test June 16** (1/2 of Meeting 9)

- Conditional Expectation (Meeting 10)
  1. Minimum Mean Square Estimation
  2. Linear Minimum Mean Square Estimation

- Random Processes (Meetings 11-13)
  1. Gaussian Processes
  2. Bernoulli Processes
  3. Poisson Processes
  4. Markov Chains

- **Third Test July 2** (1 2/3 hours of Meeting 13)


**Other Reference Books:**


**Prerequisite:** STAT 346 or equivalent.

**Attendance and homework:**

1. Students are encouraged to attend all classes and to work out as many problems from the book as they can. Selected problems will be reviewed in class. Solutions to all problems can be found in the book’s Web page.
2. We shall have two lectures per week with the first meeting on Tuesday 5/19 and the last meeting on 7/2. There will be no lecture on Tuesday 6/30. Since the 7:00-10:00pm time slot includes 20 additional minutes beyond the standard lecture time, we would only need 13 meetings for a total of 39 hours. We shall use $37\frac{1}{3}$ hours for lectures (just like in a regular semester) and $1\frac{2}{3}$ hours for the third test. There will be no final exam in this course.

Communication:

Announcements, 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:

There will be three in class tests, each of about 1.5 hours. I will drop the lowest grade and average the two highest grades.