ECE528 - Spring 2014
Introduction to Random Processes in ECE

Instructor: Professor Yariv Ephraim
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Office Hours: Wednesday: 6:10-7:10 pm
Thursday: 3:20-4:20 pm
Other time by appointment

Course Credit: 3 credit hours
Time: Wednesday 7:20-10:00 pm
Place: Innovation Hall, Room 131
Span: 22 January - 30 April
Spring Break: 3/10 - 3/16
Final Exam: Comprehensive exam on Monday 5/7, 7:30 - 10:15 pm
Mid-term exams: February 19, March 26, 7:20 - 10:00 pm.
Exams Policy: All exams are closed books closed notes. Electronic devices of any kind are not allowed. A list of formulas from the book will be provided for the final exam.
Prerequisites: Grade C or better in STAT 346 or equivalent.
Recitation: Thursday, 5:55 - 7:10 pm, Robinson Hall, Room B102.
See http://www.athenasc.com/probbook.html

Other Reference Books:

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 mid-term exam: February 19 (Week 5)

• General Random Variables (Weeks 6-8)
  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 mid-term exam: March 26 (Week 9)

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

• Jointly Gaussian Random Variables (Week 11)

• Conditional Expectation (Week 12)
  1. Minimum Mean Square Estimation
  2. Linear Minimum Mean Square Estimation

• Random Processes (Weeks 13-14)
  1. Gaussian Processes
  2. Bernoulli Processes
  3. Poisson Processes
4. Markov Chains

Attendance and homework:

1. Students are encouraged to attend all lectures and to submit all homework assignments.

2. Practicing the material taught in class, by solving the homework problems, is crucially important to your success in this class. Homework will be assigned Weekly.

3. Homework assignments are due in class the week following their assignment.

4. You are encouraged to discuss the material and homework problems with other classmates, but you must submit your OWN solutions.

5. The textbook’s homepage contains solutions to all problems in the book. Solutions to assigned problems from the book 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.

6. Copying solutions for homework assigned problems, from any source, constitutes a violation of the university honor code. See the paragraph on Academic Integrity below.

7. Electronic devices of any kind are not allowed (and will not be needed) during exams.

8. Students must use their MasonLive email account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information. Homework assignments, homework solutions, course material, etc, will be emailed to your MasonLive email account. Please make sure that your mail box is not full at any time during the semester. Also, when you send me an email, please write ece528 on the subject line.

9. Students who cannot attend an exam due to religious holidays and observations should contact me before the exam to arrange for an alternative date.

Grading:

The lower grade of the two mid-term exams will be dropped. The final grade will be calculated as 50% of the higher grade of the two mid-term exams, plus 50% of the grade of the final exam, plus 10% extra credit for homework.

Student Support:

A list of student support resources on campus may be found in: http://ctfe.gmu.edu/teaching/student-support-resources-on-campus/

University Policies: The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.
**Academic Integrity:** GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else’s work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

**Office of disability services:** If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. http://ods.gmu.edu

**Other useful campus resources:**

- Writing center: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu
- University libraries: Ask a Librarian http://library.gmu.edu/mudge/IM/IMRef.html
- Counseling and psychological services (CAPS): (703) 993-2380; http://caps.gmu.edu