ECE528 - Fall 2015
Introduction to Random Processes in ECE
(Syllabus updated on August 30, 2015)

Instructor: Professor Yariv Ephraim
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Office Hours: Monday: 5:00-6:00 pm; Thursday: 3:20-4:20 pm

Course Credit: 3 credit hours
Time: Monday 7:20-10:00 pm
Place: Aquia Building, Room 219

Columbus Day: There will be no class on Monday 10/12. We shall meet instead on Tuesday 10/13, same time, same place.

Recitation: Thursday 5:55-7:10 pm, Robinson Hall Room A248.

TA Information: Ms. Neshat Etemadi Rad; Office hours: Thursday 4-6 pm in ENGR- 3204; Email: netemadi@masonlive.gmu.edu.

Final Exam: Comprehensive exam on 12/14, 7:20-10:15pm.

Mid-term exams: 10/19 and 11/16, 7:20-9:00pm.

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.

Grading: 1st test 25%; 2nd test 30%; 3rd test 35%; homework 10%.

Prerequisites: Grade C or better in STAT 346 or equivalent.

Required Text Books:

- Y. Ephraim, Class Notes in ECE 528: Introduction to Probability and Random Processes in ECE, Fall 2015.
  See http://www.athenasc.com/probbook.html

Supplementary 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, actuarial sciences, 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:

• Probability Spaces and Models (Weeks 1,2)
  1. Probability Axioms
  2. Probability Models
  3. Conditional Probability
  4. Total Probability and Bayes Rule
  5. Independence

• Discrete Random Variables (Weeks 3,4,5)
  1. Single Random Variable and Important PMFs
  2. Expectation
  3. Multiple Random Variables
  4. Bernoulli random process
  5. Conditioning
  6. Covariance

• General Random Variables (Weeks 6,7,8)
  1. Single Random Variable and Important PDFs
  2. Expectation
  3. Multiple Random Variables
4. Conditioning  
5. Conditional Expectation  
6. MMSE Estimation

- Derived Distributions (transformations of random variables): (Week 9)
- Moment Generating Function (Week 10)
- Jointly Gaussian Random Variables (Week 11)
- Discrete-Time Random Processes (Week 12)
  1. Wide-Sense and Strict-Sense Stationarity  
  2. Autocorrelation and Power Spectral Density  
  3. Transfer of Random Processes Through Linear Systems  
  4. Gaussian Processes
- Continuous-time Gaussian Processes and Matched filter (Week 13)
- Introduction to Markov Chains (Week 14)

Attendance and homework:

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

2. Students are encouraged to type their homework submissions in Latex. You may use the Latex editor Texmaker and the Latex compiler MikTex which are available for free on the Internet. A Latex template will be provided upon request.

3. Practicing the material taught in class, by working out the homework problems, is crucially important to your success in this class. Homework will be assigned weekly, and will be due in class the week following their assignment. Graded homework will be returned in class the week following their due date.

4. Late homework submission will not be graded. No exceptions except for medical emergencies.

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

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

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

9. Audio taping, video taping, or picture snapping, during lectures, are not allowed.

10. 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 and other course material will be emailed to your MasonLive email account. Please make sure that your mailbox is not full at any time during the semester. Also, when you send me an email, please write ece528 on the subject line.

11. Students who cannot attend an exam due to religious holidays and observations should contact me as soon as possible to arrange for an alternative date.

Support Resources: A list of 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