Instructor: Professor Yariv Ephraim

Office: Nguyen Engineering Building Room 3229

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Phone: (703) 993-1562

Office Hours: Monday 6:00-7:00 pm, Tuesday 3:15-4:15 pm.

Course Credit: 3 credit hours

Time: Tuesday, 4:30-7:10 pm

Place: Planetary, Room 127.

Date Range: August 28, 2017 - December 4, 2017.

Labor Day: Monday, September 3, university closed.

Columbus Day: There will be no class on Monday 10/9.

Thanksgiving recess: University closed during 11/21-25.

Recitation: Wednesday 7:20 - 8:35 pm, Enterprise Hall 274.

TA Information: Ms. Marjan Saadati; Email: msaadati@masonlive.gmu.edu; Office Hours: Friday and Thursday, 8:00 am - 9.30 am, in ENGR 3204.

Final Exam: Comprehensive exam on December 18, 4:30-7:15 pm.

Mid-term exams: 10/16, 11/20.

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, August 15, 2018. Notes are sold (Mason Money only) by the department (at the Tech Shop - ENGR 3916) for nominal fee of about $10.00 to cover printing costs only.

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 must register to the recitation session which is an integral part of this course. Students are expected to attend all recitation sessions. The TA will take weekly attendance.

3. Practicing the material taught in class, by working out the homework problems, is crucially important to success in this course. Homework will be assigned weekly, and will be due in class by 4:30pm the week following their assignment. Graded homework will be returned in class normally the week following their due date.

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

5. Homework submitted via email will not be accepted without prior approval.

6. Homework solutions must be clearly stated with each problem clearly marked.
7. Students are encouraged to type their homework solutions using Latex. I recommend the Texmaker Latex editor, and the compatible MikTex Latex compiler which are available free of charge on the Internet. See http://www.xm1math.net/texmaker/
https://miktex.org/
A Latex template will be provided upon request.

8. Students are encouraged to discuss the material and homework problems with their classmates, but they must submit their OWN solutions.

9. 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.

10. Copying solutions for assigned homework problems, from any source, constitutes a violation of the university honor code. Students suspected of cheating on their homework or tests will be immediately referred to the honor code committee without further warning. These students will be contacted directly by the honor code committee. See also the paragraph on Academic Integrity below.

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

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

13. 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 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.

14. 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