ECE-340
Spring 2017
Probabilistic Methods in Engineering (3 credits)
T, Th 9:30-10:45   Room: MITCH 202

Syllabus

Course Goals: To introduce the student to basic theoretical concepts and computational tools in probability and statistics with emphasis on their role in solving engineering problems.

Course Catalog Description: Introduction to probability, random variables and random processes, probability distribution/density functions, expectation, correlation, confidence intervals, power spectral density, WSS processes, transmission through LTI systems, applications of probability.

Prerequisites: Math 314 and ECE 314.

Textbook: Probability, Statistics and Stochastic Processes, A Friendly Introduction for Electrical & Computer Engineers, 3rd Edition, R.D. Yates and D. J. Goodman, Wiley, 2014.

Online course materials: Course assignment, solutions, announcements, handouts, review materials, etc., will be available on UNM Learn to registered students: https://learn.unm.edu

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	Weekly recitation: TBD

Course Requirements

1) Verbal and written communication
Oral and written communications are extremely important in the educational and professional settings. Each student is expected to participate in classroom discussions. Students are also expected to exhibit good writing when working homework assignments, projects, quizzes and examinations.

2) Homework
Homework assignments will include problems from the text as well as special problems that are closely tied to the lectures notes. Some problems may require the use of MATLAB, which is available in the ECE Computer labs. Computer-aided simulation and analysis (using MATLAB) of random phenomena will be an integral part of the course for two reasons. First, simulation of

practical problems will motivate students and gives them a realistic and enjoyable feel to the concept of chance. Second, Monte-Carlo based methods are necessary for the simulation and analysis of certain problems that cannot be solved analytically. Completion of homework assignments is a key component of this course, as it will help students master the course material and prepare for the exams. Late submissions are generally not accepted unless under extreme conditions. Solutions will be provided when the assignments are submitted.

- **Homework assignments are due on Thursdays no later than 5:30PM. Submission instructions will follow.**
- **Late submissions will not be accepted in general. Exceptions are granted in case of emergencies (e.g., medical conditions, unforeseen work/family related travel, etc.).**

3) Examinations

There will be two required midterms and a final examination. Make-up exams are given *only* under extreme conditions (such as in a medical emergency with a written note from a doctor).

4) Quizzes

There will be a 5-minute quiz every Tuesday in the beginning of the class period. Each quiz will be on the material covered in the past lectures before the quiz. The purpose is to (1) encourage students to study the materials carefully and regularly and (2) to prepare the student for learning new materials.

5) Attendance

Attendance is mandatory. Missing more than two lectures requires the permission of the instructor.

6) Small-group term project

Groups of 2 students will be required to work on a small project comprising experimentation of a random phenomenon and analysis of results. The specifics of the project will be announced before the Spring Break. The project is due on the final class period. Each group will be asked to prepare a brief report. Tools learned in class should be used to complete the design and the use of Matlab is required.

7) Recitation sessions

There will be weekly recitation sessions on problem solving. Attendance is required unless there is a conflict in schedule. The day and time will be announced during the first week of class after student input is received.

8) Conduct
Students are expected to comply with the *Student Code of Conduct* found in the UNM Student Handbook. In particular, exchange of information during exams and quizzes is strictly prohibited.

Grading

10%	Completion of homework assignments
5%	Weekly 5-minute quizzes

20%   First Exam, **Thursday, Feb. 23**
20%   Second Exam, **Thursday, Apr. 6**
30%   Final Exam: Room CENT-1041; **Friday May 13, 7:30-9:30AM**
15%   Small-group project (details to be announced)

Tentative grade assignment:
90-100 (A);
80-89 (B);
70-79 (C);
60-69 (D);
59 or below (F).

Some important dates:
Last day to drop without a grade: Friday, Feb. 3
Spring Break: March 12 – 19
Last class period for this course: Thursday, May 4
Final examination: Tuesday May 9, 7:30AM-9:30AM, MITCH 202

Outline of topics to be covered

Main topics and chapters	Sections
Chapter 1: Experiments, models and probabilities	1.1-1.7
Chapter 2: Sequential experiments	2.1-2.5
Chapter 3: Discrete random variables	3.1-3.9
Chapter 4: Continuous random variables	4.1-4.8
Chapter 5: Multiple random variables	5.1-5.11
Chapter 6: Functions of random variables	6.1-6.6
Chapter 7: Conditional probability models	7.1, 7.2, 7.4-7.7
Chapter 9: Sums of random variables	9.1-9.3, 9.5-9.7
Chapter 10: The sample mean (Laws of large numbers and elements of statistics)	10.1-10.3, 10.5, 10.6
Chapter 13: Stochastic processes	13.1, 13.7, 13.9-13.11
Supplementary material: Power spectral density for WSS processes, transmission through LTI systems	Handouts

Additional Resources:

Probabilistic Methods of Signal and System Analysis, G. R. Cooper and C. D. McGillem, 3rd edition, Oxford University Press, 1999.

Probability, Statistics and Random Processes for Electrical Engineering, 3rd Edition, A. Leon-Garcia, Publisher: Pearson (Prentice Hall), 2008.