EE 503 **Probability for Electrical and Computer Engineers** **Fall 2018**

Course Syllabus and Information v.1.4
4 September 2018

The deadline to add or drop this class (with 100% refund) is 7 September 2018
The withdrawal deadline (no refund) is 9 November 2018

Course Summary: This course covers mathematical and probabilistic descriptions of unpredictable or random phenomena, with applications to many engineering problems. Probabilistic tools are among the most useful for modeling real systems and analyzing system performance. The course provides a solid background in probability theory and related topics for graduate students in electrical and computer engineering (ECE), financial engineering, and other engineering majors. The course includes material from first principles in a more rigorous manner than is typically found in undergraduate probability classes in engineering.

Prerequisites: Calculus, linear algebra and matrices

Class Time and Location: Tuesday and Thursday, 10:00 am-11:50 am, OHE 122
Discussion: Friday, 1:00 pm-1:50 pm, OHE 122

Instructor: A.A. Sawchuk; EEB 404B; phone: 213-740-4622; fax: 213-740-6618;
email: sawchuk@usc.edu; http://sipi.usc.edu/~sawchuk

TAs, Graders, Office Hours:

EE 503 Fall 2018 Schedule					
	Email	**EE 503 office hours**	**Office hour location**	**Physical office and phone there**	
Instructor					
Alexander Sawchuk	sawchuk@usc.edu	W 10:00-12:00	EEB 404B	213-740-4622	
TAs					
Yu-Chen (Ethan) Sung	yuchens@usc.edu		PHE 320	EEB 307 213-740-4454	
Ye Wang	wang316@usc.edu		PHE 320	EEB 418	
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
9:00-9:30	Ye-office hours PHE 320				
9:30-10:00					
10:00-10:30		Sawchuk-class OHE 122	Sawchuk-office hours EEB 404B	Sawchuk-class OHE 122	
10:30-11:00					
11:00-11:30					
11:30-12:00					
12:00-12:30					
12:30-13:00					
13:00-13:30					discussion OHE 122
13:30-14:00					
14:00-14:30					Ye-office hours PHE 320
14:30-15:00					
15:00-15:30	Ethan-office hours PHE 320	Ethan-office hours PHE 320		Ethan-office hours PHE 320	
15:30-16:00					
16:00-16:30					
16:30-17:00					
17:00-17:30					
17:30-18:00					
Graders					
Sichen (Carol) Zhou	sichenz@usc.edu				
Yixuan (Ethan) Zhou	zhouyixu@usc.edu				

Texts and Readings
Handouts and supplementary class notes will be distributed.

The required course textbook is:
Alberto Leon-Garcia, *Probability, Statistics, and Random Processes for Electrical Engineering, 3rd Edition*, Pearson Prentice Hall, 2008 (ISBN 978-0-13-147122-1)

An optional textbook is:
Sheldon M. Ross, *Introduction to Probability Models, 11th Edition,* Academic Press, 2014.

The following two outline-type books may also be useful. They have many examples and supplementary solved problems:
1. Seymour Lipschutz and Marc Lipson, Schaum's Outline of Probability, Second Edition (Schaum's Outline Series) Paperback
http://www.amazon.com/gp/product/0071755616/ref=wms_ohs_product?ie=UTF8&psc=1

2. Hwei Hsu, Schaum's Outline of Probability, Random Variables, and Random Processes, 3rd Edition (Schaum's Outline Series) Paperback
http://www.amazon.com/Schaums-Outline-Probability-Variables-Processes/dp/0071822984/ref=dp_ob_title_bk

See http://www.slugbooks.com for other possible vendors of these books.

Course Web Site and Email
Make sure your email listed in USC records is up-to-date; I will contact you often by email. The course web site is accessible through https://courses.uscden.net/d2l/home. We will use the Piazza collaboration tool, accessible through D2L - links will be provided later.

Grading
Your course grade is determined by the following ***four*** components using the weights listed.

1). In-class quizzes = 6% -- approximately 10 in-class 5-10 minute quizzes given at the beginning of lecture. The quizzes will occur about once per week and may be on a Tuesday or Thursday. The lowest two quiz grades will be dropped with no penalty. DEN students will take the same quiz via D2L with the same time limitations.
2). Two midterm exams = 21% each -- in class, Tuesday, 2 October and Tuesday, 6 November
3). Final exam = 40% -- given Tuesday, 11 December, 8:00 am-10:00 am as listed in the USC exam schedule; there are NO exceptions to this date - if you can't take the final at this time, do not enroll in this course

At the above quizzes and exams, one 8.5"x11" or A4 two-sided sheet of notes and a simple ordinary or scientific calculator (not part of a smart phone, iPod, iPad, etc.) are allowed. No other materials, devices, iPods, iPads, phones, books, etc. are allowed. DEN students in the local area must come to campus for the midterm and final exams.

4). Homework = 12% (two lowest average homework grades will be discarded)

Midterm, final exams and course grades are assigned by examining the experimental score distribution for each and setting thresholds for grades (e.g. A, A-, B+, B, B-, etc. (i.e. grading "on the curve")).

Attendance in class is required. Many examples and applications not in the text will be covered in the lectures.

Homework
Homework will be assigned every week on Thursday, and due the following Thursday. Homework will be graded – solutions are provided on Tuesday following the due date..

The ultimate deadline for submitting any homework (either in class or uploaded (for DEN students)) is the end of the Tuesday lecture (12:00 Noon Pacific time) FOLLOWING the due date (due dates are always on Thursdays). Thus you always have a 5 day grace period following the due date, although I strongly discourage falling behind by submitting anything late. You will receive full credit for anything submitted prior to the ultimate deadline. The reason for the 12:00 Noon Pacific time due date is that solutions will be posted at that time. Thus, you receive zero credit for submissions after that deadline. The submission deadline is the same for everyone regardless of where you are physically located.

It is extremely important to keep up with the lectures and to do the homework problems. Many details and applications of the principles are learned by doing problems.

Use of Cell Phones, iPads, Laptops and Other Devices During Lecture
All devices that make noise must be turned off or silenced during lectures. It is OK to use iPads, laptops, etc. to take notes if this is done without disrupting other students. Using cell phones during lecture for text messages, making videos and web surfing is rude and distracting to other students who are trying to follow the lecture material. This behavior is ***NOT*** acceptable. Videos of the lectures are available on D2L soon after class.

Academic Integrity - Cheating
Cheating or plagiarism will not be tolerated on homework or exams. You may discuss homework problems among yourselves, but each person must do their own work and submit individual solutions written in their own hand. Copying or turning in identical homework sets is cheating. The penalty ranges from F on the homework or exam, to an F in the course, to recommended expulsion. See:

https://viterbischool.usc.edu/academic-integrity/
http://sjacs.usc.edu/students/academic-integrity/
https://libraries.usc.edu/research/reference-tutorials

If you have any questions regarding academic integrity - see the instructor.

USC Statement on Academic Integrity
USC seeks to maintain an optimal learning environment. General principles of academic honesty include: the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00)

Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.
https://engemannshc.usc.edu/counseling/

National Suicide Prevention Lifeline - 1-800-273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. http://www.suicidepreventionlifeline.org

Relationship & Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. https://engemannshc.usc.edu/rsvp/

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: http://sarc.usc.edu/

Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class.
https://equity.usc.edu/

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

Student Support & Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. https://studentaffairs.usc.edu/ssa/

Diversity at USC
Tabs for Events, Programs and Training, Task Force (including representatives for each school), Chronology, Participate, Resources for Students. *https://diversity.usc.edu/*

Week	Start Date	End Date	Course Topics
1	20-Aug	24-Aug	Algebra of events; set theory; sample and event spaces; probability axioms; independence
2	27-Aug	31-Aug	Conditioning; Bayes rule
3	3-Sep	7-Sep	Counting; combinatorics
4	10-Sep	14-Sep	Sequential experiments; Bernoulli trials, discrete and continuous random variables (RVs) and densities
5	17-Sep	21-Sep	Common densities: Gaussian, Poisson, Cauchy; expectation; moments; two or more RVs
6	24-Sep	28-Sep	2D densities
7	1-Oct	5-Oct	2-Oct-Midterm 1; 2D expectation; covariance; correlation; one function of one RV
8	8-Oct	12-Oct	One function of two RVs
9	15-Oct	19-Oct	Two functions of two RVs; jointly normal RVs
10	22-Oct	26-Oct	Characteristic functions; discrete and continuous transforms
11	29-Oct	2-Nov	Central limit theorem; approximations; bounds
12	5-Nov	9-Nov	6-Nov-Midterm 2; sample mean; laws of large numbers; convergence; parameter estimation
13	12-Nov	16-Nov	Vector RVs; Gaussian random vectors; estimation of RVs
14	19-Nov	23-Nov	22-Nov-Thanksgiving Holiday-no class; estimation of RVs: MAP, ML, MMSE, linear, nonlinear; stochastic processes; discrete time Markov processes
15	26-Nov	30-Nov	Markov chains
16	3-Dec	7-Dec	Study week - possible review class
17	10-Dec	14-Dec	11-December-Final exam - 8-10 am

Follow-on Classes

EE 450 Introduction to Computer Networks (3)
EE 511 Simulation Methods for Stochastic Systems (1)
EE 512 Stochastic Processes (3)
EE 517 Statistics for Engineers (3)
EE 562a Random Processes in Engineering (3)