SYLLABUS

Probability for Electrical and Computer Engineers

EE 503: Fall 2019 (4 units)

This course focuses on reasoning with probabilistic uncertainty. This involves developing careful skills in logical reasoning and applying those skills to a wide range of problems. The course depends primarily on lecture material and handouts. Attendance is mandatory. There are weekly exams and no make-ups. Unexcused absences or departures result in an automatic exam score of zero.

Instructor: Brandon Franzke
Email: franzke@usc.edu
Office: EEB 420

Hours: Monday 12:00 – 13:00
Tuesday 18:30 – 20:00
Thursday 14:00 – 15:00

Lecture
Tuesday and Thursday (section: 30856)
16:00 – 17:50

Piazza

Piazza gets you help fast and efficiently from classmates, the TAs, and myself. I encourage you to post questions on Piazza rather than emailing questions to the teaching staff.

https://piazza.com/usc/fall2019/ee503

Canvas

Use Canvas to electronically submit your homework and view course grades. You will receive an email to register during the first week of classes. Contact the instructor with any issues.

https://canvas.usc-ece.com

TAs and grader

TA: Olaoluwa Adigun
Office: EEB 420
Office hours: TBD
Email: adigun@usc.edu

TA: Tianchen Yuan
Office: TBD
Office hours: Monday, 15:00 – 17:00
Email: tianchey@usc.edu

TA: Kaiheng Zou
Office: TBD
Office hours: TBD
Email: kaihengz@usc.edu

Grader: TBD
Office hours: by appointment
E-mail:

Course materials

"Probability and Random Processes for Electrical and Computer Engineers", 1st edition, John A. Gubner, Cambridge University Press, 2006, (ISBN: 0521864704). (*required*).

"Probability, Statistics, and Random Processes for Electrical Engineering", 3rd edition, Alberto Leon-Garcia, Pearson, 2008, (ISBN: 0131471228). (*required*).

"Computer Age Statistical Inference: Algorithms, Evidence, and Data Science", 1st edition, Bradley Efron and Trevor Hastie, Cambridge University Press, 2016, (ISBN: 1107149894). (*recommended*).

Note: The texts are secondary to in-class lecture material and homework sets.

Course Outline (tentative)

	week of	
1	27 Aug	Logic and sets. Proof technique. Sigma algebras. Probability axioms.
2	03 Sep	Uncountability. Independence. Borel sigma-algebra. Total probability.
3	10 Sep	Combinatorics.
4	17 Sep	Limits of sequences. Borel-Cantelli Lemma.
5	24 Sep	Discrete densities and approximations. Poisson Theorem.
6	01 Oct	Random variables. Continuous densities and cumulative distributions.
7	08 Oct	Expectations and moments of random variables.
8	15 Oct	Covariance. Correlation. Uncertainty principles.
	17 Oct	**No class: Fall Recess, University holiday**
9	22 Oct	Stochastic convergence. Laws of large numbers.
10	29 Oct	Conditional expectations. Maximum likelihood estimation.
11	05 Nov	Transformed densities. Monte Carlo. Entropy and mixtures.
12	12 Nov	Central limit theorem. Confidence intervals. Approximations using R.
13	19 Nov	Financial engineering estimates. Martingales and Markov chains.
14	26 Nov	Markov chains and queues. Optimal estimation and ordinary least squares.
	28 Nov	**No class: Thanksgiving Recess, University holiday**
15	03 Dec	Ordinary least squares. Advanced applications. Review.
	12 Dec	**Final, 16:30 – 18:30**

Grading Procedure

Weekly Exams

60 Points. 14 weekly exams. Closed book. 10 minutes per exam at the start of each Tuesday lecture session. Each exam will be a single problem based on the previous weeks' homework and lecture material. No make-up exams. Each exam is worth 6 points. Missed exams earn an automatic 0. The total weekly exam score sums your 10 best weekly exam scores. Algorithm: label your weekly exam scores from lowest to highest: $w_1 \leq \cdots \leq w_{13}$. Then $W = w_5 + \cdots + w_{14}$ is your total weekly-exam score. Class attendance is mandatory. Unexcused absences get an automatic exam score of zero for that session's exam grade.

Final Exam

40 Points. The final exam is closed book with no additional note sheets allowed. You are expected to bring a non-graphing scientific calculator. You must show how you arrived at your answers to receive full credit. Any cheating may result in an "F" in the course and will be referred to Student Affairs for other penalties.

Homework

Textbook problems are checked but not graded. Homework handout problems are graded but count only as optional points. They count at most as 10 points if all homework sets turned in and accurately worked. Your grade remains as is if only some homework turned in. How much homework affects which cases is at the discretion of the instructor and the teaching assistant. You may discuss homework problems with classmates but each student must do his or her own work. Cheating warrants an F in the course. Turning in identical homework sets counts as cheating.

Course Grade

A if 90 – 100 points
B if 80 – 89 points
C if 70 – 79 points
D if 60 – 69 points
F if 0 – 59 points
("+" and "-" within approx. 3% of grade boundary)

Attendance and Participation

Attendance is mandatory to all lectures and discussions. You are responsible for missed announcements or changes to the course schedule or assignments. Taping lectures is strictly forbidden.

Cheating

Cheating is not tolerated on homework or exams. Penalty ranges from F on exam to F in course to recommended expulsion.

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 Section 11, Behavior Violating University Standards https://scampus.usc.edu/1100-behavior-violating-university-standards-andappropriate-sanctions. 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.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity http://equity.usc.edu or to the Department of Public Safety http://capsnet.usc.edu/department/department-public-safety/online-forms/contactus. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men http://www.usc.edu/studentaffairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage http://sarc.usc.edu describes reporting options and other resources.

Academic Integrity

Academic integrity is critical the assessment and evaluation we perform which leads to your grade. In general, all work should be your own and any sources used should be cited. Gray-areas occur when working in groups. Telling someone how to do the problem or showing your solution is a VIOLATION. Reviewing examples from class or other sources to help a fellow classmate understand a principle is fine and encouraged. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, contains the University Student Conduct Code in Section 10, while the recommended sanctions are located in Appendix A. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information http://emergency.usc.edu will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

Academic Accommodations

Any student requiring academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. DSP is located in GFS 120 and is open 08:30 – 17:00, Monday through Friday. The phone number for DSP is (213) 740-0776.