

SYLLABUS (07 Jan 2022)

Probability for Electrical and Computer Engineers

EE 503: Spring 2022 (4 units)

This course focuses on reasoning under 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 supplemental handouts. Attendance is mandatory. There are weekly exams and no make-ups. Unexcused absences or departures result in an automatic zero exam score.

Instructor: Brandon Franzke
Email: franzke@usc.edu
Office: EEB 504B
Zoom: meet: [998 5176 5591](https://usc.zoom.us/j/99851765591)
code: 574987
Hours: Wednesday: 14:00 – 15:30
Thursday: 10:00 – 12:00 (remote)

Lecture

Monday and Wednesday (section: 30984)
12:00 – 13:50

Discussion

Friday (section: 30678)
09:00 – 09:50[§]

Piazza

<https://piazza.com/usc/spring2022/ee541>

Piazza enables fast and efficient help from classmates and instructors. Use Piazza to post questions about course material, homeworks, and policies instead of emailing questions to the teaching staff.

Canvas

<https://canvas.usc-ece.com>

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 Dr. Franzke with any technical issues.

TAs and staff

TA:	Ranga Sai Shreyas Manchikanti	Grader/CP:	Jugal Krishna Kakarla
Zoom:	meet: 990 7276 0488	Hours:	by appointment
	code: 245699	E-mail:	jkakarla@usc.edu
Hours:	Monday 10:00 – 11:30		
Email:	rmanchik@usc.edu		

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	10 Jan	Logic and sets. Proof technique. Sigma algebras. Probability axioms.
2	17 Jan	No class: Martin Luther King Day, University holiday.
	19 Jan	Uncountability. Independence. Borel sigma-algebra. Total probability.
3	24 Jan	Combinatorics. Limits of sequences and sets. Borel-Cantelli Lemma.
4	31 Jan	Discrete probability and approximations. Poisson Theorem.
5	07 Feb	Random variables. Continuous densities and cumulative distributions.
6	14 Feb	Expectations and moments of random variables.
7	21 Feb	No class: Martin Luther King Day, University holiday.
	23 Feb	Covariance. Correlation. Uncertainty principles and applications.
8	28 Feb	Stochastic convergence. Laws of large numbers.
9	07 Mar	Conditional expectations. Maximum likelihood estimation.
	14 Mar	No class: Spring break, University holiday.
10	21 Mar	Transformed densities. Monte Carlo. Entropy and mixtures.
11	28 Mar	Central limit theorem. Confidence intervals. Approximations using R.
12	04 Apr	Financial engineering. Rational Pricing. Martingales.
13	11 Apr	Markov processes. Discrete time Markov chains.
14	18 Apr	Optimal estimation and least squares.
15	25 Apr	Markov queues. Advanced applications. Review.
	06 May	Final, 11:00 – 13:30

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 or recording lectures or discussions is strictly forbidden.

Grading Procedure

Weekly Exams

60 Points. 14 weekly exams. **Closed book.** 10 minutes per exam at the start of each Monday lecture session. Each exam will be a single problem based on previous weeks' homework and lecture material. No make-up exams. Each exam is worth 6 points. In class attendance is mandatory. Missed exams earn an

automatic 0. Unexcused absences get an automatic zero exam score for that week's exam grade. The total weekly exam score sums your 10 best weekly scores. Algorithm: label your weekly exam scores from lowest to highest: $w_1 \leq \dots \leq w_{13}$. Then $W = w_4 + \dots + w_{13}$ is your total weekly-exam score.

Final Exam

40 Points. The final exam is **closed book with no 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 will result in an "F" in the course and will be referred to Student Affairs for other penalties. Make up exams will only be given for valid medical or family emergency excuses (proof required).

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 original 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)

Cheating

Cheating is not tolerated on homework or exams. Penalty ranges from F on assignment or 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.