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 in probabilistic and statistical inference from signal processing to machine learning. The course depends primarily on lecture material and handouts. Attendance is mandatory. There are weekly exams and no make-ups. Unexcused absences or early departures result in an automatic zero exam score.

Lecture
Monday (section: 30401)
12:00 – 16:10

Discussion
Friday (section: 30402)
10:00 – 10:50

Enrollment is in-person ONLY. Attendance is mandatory to all lectures and all discussions. Taping or recording lectures or discussions is strictly forbidden without the instructor’s explicit written permission.

Instructor: Brandon Franzke
Email: franzke@usc.edu
Office: EEB 504B
Hours: Thursday: 12:00 – 14:00 (remote)

Course materials

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

TAs and staff
TA: Akash Panda
Email: akashpan@usc.edu
Office: OHE 420
Hours: TBA
Grader: Venkata Meghana Achanta
E-mail: vachanta@usc.edu

Piazza https://piazza.com/usc/summer2023/ee503

Canvas https://canvas.usc-ece.com

Electronically submit homework and view grades. You will receive a registration email during the first week of class. Contact Dr. Franzke with technical issues.
Course Outline (tentative)

<table>
<thead>
<tr>
<th>week of</th>
<th>Date</th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
<td>22 May</td>
<td>Logic and sets. Proof technique. Sigma algebras. Probability axioms.</td>
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<tr>
<td>2</td>
<td>29 May</td>
<td><strong>No class, Memorial Day.</strong></td>
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<tr>
<td>3</td>
<td>05 Jun</td>
<td>Combinatorics. Limits of sequences and sets. Borel-Cantelli lemmas.</td>
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<tr>
<td>4</td>
<td>12 Jun</td>
<td>Discrete probability and approximations. Poisson Theorem.</td>
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<tr>
<td>5</td>
<td>19 Jun</td>
<td><strong>No class, Juneteenth.</strong></td>
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<tr>
<td>6/7</td>
<td>26 Jun</td>
<td>Expectations and moments of random variables.</td>
</tr>
<tr>
<td>03 Jul</td>
<td></td>
<td><strong>No class, Independence Day (observed).</strong></td>
</tr>
<tr>
<td>8</td>
<td>05 Jul</td>
<td>Stochastic convergence. Laws of large numbers.</td>
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<tr>
<td>12</td>
<td>31 Jul</td>
<td>Discrete time Markov processes. Optimal estimation and least squares.</td>
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<tr>
<td>03 Aug</td>
<td></td>
<td>Review.</td>
</tr>
<tr>
<td>07 Aug</td>
<td></td>
<td>Final, 12:00 - 14:30</td>
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</tbody>
</table>

Grading Procedure

**Weekly Exams**

60 Points. 11 weekly exams. **Closed book.** 10 minutes at the start of each Monday lecture session (and Wednesday on week 6). Each weekly exam is worth 6 points. No make-up exams. Missed exams earn 0 points. The total weekly exam score sums your 10 best weekly exam scores. Algorithm: label your weekly exam scores from lowest to highest: $w_1 \leq \cdots \leq w_{11}$. Then $W = w_2 + \cdots + w_{11}$ is your total weekly-exam score. Class attendance is mandatory. **Unexcused absences get an automatic exam score of zero for that week’s exam grade.**

**Final Exam**

40 Points. Cumulative. The final exam is **closed book with no note sheets**. You are expected to bring a non-graphing scientific calculator.

**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 submit their 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 "–" at $\approx 2.5\%$ 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/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.