

Units: 3

Instructor: Mohammad Reza Rajati, PhD

PHE 414

rajati@usc.edu – Include 364 in subject

Office Hours: Monday 1:00 –3:00

TA(s): Filipe Vital

fvital@usc.edu – Include EE 364 in subject

Office Hours: TBD

Grader(s): Siddharth Gupta

gupt232@usc.edu – Include EE 364 in subject

Lecture: Monday, Wednesday, 4:00 - 5:20 pm in THH 119

Discussion: Friday, 4:00-4:50 am in THH 106

Webpages: [Piazza Class Page](#) for everything except grades
and [USC Blackboard Class Page](#) for grades

– All HWs, handouts, solutions will be posted in PDF format

– *Student has the responsibility to stay current with webpage material*

Prerequisites: 1 from (MATH 225 or MATH 245).

– This course is a prerequisite or corequisite to EE 484

Other Requirements: Basic computer skills (e.g., plotting, Matlab, Excel, Python, etc.).

Tentative Grading: The maximum of the following methods:

Assignments 15%

Midterm 1 25%

Midterm 2 25%

Final Exam 35%

Participation in Class and on Piazza* 5%

or

Assignments 15%

Midterm 1 20%

Midterm 2 20%

Final Exam 45%

Participation in Class and on Piazza* 5%

Letter Grade Distribution:

≥ 93.00	A	73.00 - 76.99	C
90.00 - 92.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	≤ 59.99	F

Disclaimer: Although the instructor does not expect this syllabus to drastically change, he reserves every right to change this syllabus any time in the semester.

Note on e-mail vs. Piazza: If you have a question about the material or logistics of the class and wish to ask it electronically, please post it on the piazza page (not e-mail). You may post it anonymously if you wish. Often times, if one student has a question/comment, other also have a similar question/comment. Use e-mail with the professor, TA, graders only for issues that are specific to your individually (e.g., a scheduling issue or grade issue).

Catalogue Description: Catalogue Description: Introduction to concepts of randomness and uncertainty: probability, random variables, statistics. Applications to digital communications, signal processing, automatic control, computer engineering and computer science.

Course Objectives: Upon successful completion of this course a student will

- Understand probability as a model for uncertainty
- Be able to perform basic set probability relations including conditional probabilities, Total Probability, and Bayes Rule
- Understand random variables as models for numerical measurements with uncertainty
- Use the complete statistical characterization of random variables (e.g., distribution and density functions) to compute probabilities
- Develop novel probability distributions given a description of a random experiment.
- Interpret the incomplete statistical characterization of random variables, such as mean and variance, to draw qualitative and quantitative conclusions.
- Be able to apply common distributions such as Gaussian, Poisson, Binomial, Exponential and uniform to solve problems as appropriate.
- Utilize joint distributions and joint moments to compute probabilities and make estimates of random variables.
- Understand the Law of Large Numbers and Central Limit Theorem and their relation to statistical analysis.
- Apply basic confidence interval formulas to characterize the accuracy of estimates from experimental data
- Make decisions between a finite set of hypotheses from experimental data

Exam Dates:

- **Midterm Exam 1:** Wednesday, February 21, 4:00 - 5:20 PM
- **Midterm Exam 2:** Wednesday, April 4, 4:00 - 5:20 AM
- **Final Exam:** Wednesday, May 2, 4:30 - 6:30 PM as **set by the university**

Textbooks:

- **Required Textbooks:**

1. *Probability, Statistics, and Random Signals*, 1st Edition

Author: Charles Boncelet; Oxford University Press, 2016. **ISBN-13:** 978-0-19-020051-0

- **Recommended Textbooks:**

1. *Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers*, 3rd Edition

Authors: Roy D. Yates and David J. Goodman; Wiley, 2014. **ISBN-13:** 978-1-118-32456-1

2. *A First Course in Probability*, 9th Edition

Author: Sheldon M. Ross, Pearson Education, 2013. **ISBN-13:** 978-9332519077

3. *Probability & Statistics for Engineers & Scientists, MyLab Statistics Update*, 9th Edition

Authors: Ronald E. Walpole and Raymond H. Myers, Pearson, 2016. **ISBN-13:** 978-0134115856

4. *Probability and Statistics*, 4th Edition

Authors: Morris H. DeGroot and Mark J. Schervish, Pearson, 2011. **ISBN-13:** 978-0321500465

Grading Policies:

- The letter grade distribution table guarantees the *minimum* grade each student will receive based on their final score. When appropriate, relative performance measures will be used to assign the final grade, at the discretion of the instructor.
 - Final grades are non-negotiable and are assigned at the discretion of the instructor. If you cannot accept this condition, you should not enroll in this course.
 - Three of your lowest homework grades will be dropped from the final grade.
 - *Participation in class and on Piazza has up to 5% extra credit, which is granted on a competitive basis *at the discretion of the instructor*.
- **Homework Policy**
 - Homework is assigned on a weekly basis. *Absolutely no late homework will be accepted. A late assignment results in a zero grade.*

- Homework solutions should be typed or *scanned* using scanners or mobile scanner applications like CamScan and uploaded on blackboard (photos taken by cell-phone cameras and in formats other than pdf will NOT be accepted). Programs and simulation results have to be uploaded on blackboard as well.
- Students are encouraged to discuss homework problems with one another, but each student must do their own work and submit individual solutions written/ coded in their own hand. Copying the solutions or submitting identical homework sets is written evidence of cheating. The penalty ranges from F on the homework or exam, to an F in the course, to recommended expulsion.
- Posting the homework assignments and their solutions to online forums or sharing them with other students is strictly prohibited and infringes the copyright of the instructor. Instances will be reported to USC officials as academic dishonesty for disciplinary action.

- **Exam Policy**

- **Make-up Exams:** No make-up exams will be given. If you cannot make the above dates due to a class schedule conflict or personal matter, you must drop the class. In the case of a required business trip or a medical emergency, a signed letter from your manager or physician has to be submitted. This letter must include the contact of your physician or manager.
- Midterms and final exams will be closed book and notes. The instructor will decide about allowing calculators, but computers and cell-phones or any devices that have internet capability. One letter size cheat sheet (back and front) is allowed for each midterm. Two letter size cheat sheets (back and front) are allowed for the final.
- All exams are cumulative, with an emphasis on material presented since the last exam.

- **Attendance:**

- Students are required to attend all the lectures and discussion sessions and actively participate in class discussions. Use of cellphones and laptops is prohibited in the classroom. If you need your electronic devices to take notes, you should discuss with the instructor at the beginning of the semester.

Important Notes:

- Textbooks are secondary to the lecture notes and homework assignments.
- Handouts and course material will be distributed.
- Please use your USC email to register on Piazza and to contact the instructor and TAs.

Tentative Course Outline

MONDAY		WEDNESDAY	
Jan 8th	1	10th	2
Introduction Set Theory		Set Theory Probability Basics	
15th		17th	3
Martin Luther King Day		Probability Basics	
22nd	4	24th	5
Conditional Probability		Combinatorics	
29th	6	31st	7
Discrete Probabilities and Random Variables		Discrete Probabilities and Random Variables	
Feb 5th	8	7th	9
Discrete Probabilities and Random Variables		Discrete Probabilities and Random Variables	
12th	10	14th	11
Multiple Discrete Random Variables		Multiple Discrete Random Variables	
19th		21st	12
President's Day		Continuous Random Variables	
26th	13	28th	14
Midterm 1		Continuous Random Variables Multiple Continuous Random Variable	
Mar 5th	15	7th	16
Multiple Continuous Random Variables		Multiple Continuous Random Variables	
12th		14th	
Spring Break		Spring Break	
19th	17	21st	18
Famous Continuous Random Variables		Famous Continuous Random Variables	
26th	19	28th	20
Famous Continuous Random Variables		Famous Continuous Random Variables	
Apr 2nd	21	4th	22
Elementary Statistics		Elementary Statistics	
9th	23	11th	24
Estimation		Midterm 2	
16th	25	18th	26
Estimation		Confidence Intervals	

MONDAY		WEDNESDAY	
23rd	27	25th	28
Hypothesis Testing		Review	

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, contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A. See: <http://scampus.usc.edu>.

Emergency Preparedness/Course Continuity in a Crisis In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies. See the university’s site on Campus Safety and Emergency Preparedness: <http://preparedness.usc.edu>

Statement for Students with Disabilities: Any student requesting 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 (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.5:00 p.m., Monday through Friday. Website: http://sait.usc.edu/academicssupport/centerprograms/dsp/home_index.html

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