

## MATH 408: MATHEMATICAL STATISTICS SPRING 2019

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CLASSROOM (LECTURES): THH 212, TIME: MWF 10 – 10:50AM  
DISCUSSION: T-TH 2 – 2:50PM AND 3 – 3:50 PM, KAP 166  
OFFICE HOURS: MONDAY 2-3PM, WEDNESDAY 3-4PM, OR BY APPOINTMENT.

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### General Information:

This course is an introduction to the fundamental ideas and techniques of mathematical statistics. One of the definitions of Statistics is “the science of basing inferences on observed data and the entire problem of making decisions in the face of uncertainty” (Freund and Walpole ‘87). In simple terms, statistics is the art of making conjectures about challenging and puzzling questions based on available data (“what are the effects of a new medical treatment?”, “what is the average income in the US?”, etc.) To answer these questions, we need tools – the methods of probability theory, “the language of uncertainty.”

Course information, assignments, selected solutions, and grades will be posted on Blackboard.

### Prerequisites:

MATH 407, MATH 126/127.

### Textbook:

**Required textbook:** *Mathematical Statistics with Applications*, 7th edition, by D. Wackerly, W. Mendenhall & R. Scheaffer will be our main reference for the class. Additional references will be provided whenever necessary.

### List of covered topics:

Chapters 1, 8-16 of the textbook. The main topics include:

- Point estimators; Maximum Likelihood Estimation; Method of Moments.
- Student’s t-distribution; Confidence intervals.
- Relative efficiency; Convergence in probability and consistency; Cramér-Rao inequality.
- Notion of sufficiency and Rao-Blackwell theorem.
- Hypothesis testing; Large-sample tests; p-values; Likelihood-ratio tests.
- Regression and linear models; correlation coefficient; multiple linear regression.
- Analysis of Variance; one-way layout and randomized block design.
- Analysis of categorical data and contingency tables.
- Introduction to nonparametric statistics (if time permits).
- Introduction to Bayesian statistics (if time permits).

**Assignments:**

Homework will be assigned in class and has to be submitted at the beginning of the discussion/problem solving session on the due date.

*Important note:* late submissions will receive no credit.

**Exams and important dates:**

Two midterm exams will take place *at the regular class meeting time* on Wednesday, February 20, and Monday, April 1. The second midterm exam will be based on the material covered after the first exam.

The final exam is on Monday, May 6, 8-10am, in THH 212 (our usual classroom). The final exam will be comprehensive, with the emphasis on the material covered after the second midterm.

All exams are closed book.

Please see the registration calendar for additional information, including the last day to drop the course: <http://classes.usc.edu/term-20173/calendar/>.

**Grading:** Grades will be based on 20% assignments/quizzes, 20% midterm exams (each) and 40% final exam. The final cutoffs for the grades will be defined based on the overall performance of the class. The basis for grades is the following scale: [95%, 100%] = A, [90%, 94%) = A-, [86%, 89%) = B+, [80%, 85%) = B, [78%, 79%) = B-, [76%, 77%) = C+, [72%, 75%) = C, [70%, 71%) = C-, [68%, 69%) = D+, [62%, 67%) = D+, [60%, 62%) = D-, [0%, 59%) = F.

**Students Requiring Special Accommodation:**

Any student requesting academic accommodations based on special needs is required to register with DSP each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor as early in the semester as possible. DSP is located in GFS 120 and is open 8:30 a.m. till 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

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**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. The Student Guidebook contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. 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. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.