

Summer 2021 - STAT 512: Mathematical Statistics

12:30 pm - 2:10 pm MTWR, Carolina Coliseum Room 3020D

Jun 21, 2021 - Jul 29, 2021

Instructor: Karl Gregory
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Office hours: After class each day in person or virtually

Bulletin description

(Prereq: STAT 511 or MATH 511 with a grade of C or higher) Functions of random variables, order statistics, sampling distributions, central limit theorem, quality of estimators, interval estimation, sufficient statistics, minimum-variance unbiased estimator, maximum likelihood, large-sample theory, introduction to hypothesis testing.

Purpose of the course

To provide a strong foundation in mathematical statistics for understanding the concepts and development of statistical methodology, and to prepare students for further study of statistical inference.

Topics covered

After taking this course, students should be able to do the following:

- Derive the distributions of transformations of random variables.
- Derive joint and marginal distributions of order statistics of random samples.
- Be familiar with pivot quantities involving the mean and variance when sampling from the Normal distribution and use these to construct confidence intervals.
- Understand bias, variance, and the mean squared error as properties of parametric estimators.
- Explain the property of consistency and the weak law of large numbers.
- Use the central limit theorem and Slutsky's theorem to define large-sample pivot quantities.
- Make basic sample-size calculations with respect to desired confidence interval width.
- Understand the notion of sufficiency of a statistic and the Rao-Blackwell theorem.
- Derive the method of moments and maximum likelihood estimators of unknown parameters.

Textbook

There is no required textbook for this course; comprehensive course notes which I expect you to read and study will be posted at the [course website](#).

Much of the course material is covered in the book *Mathematical Statistics with Applications*, 7th edition (2008), by Wackerly, D., Mendenhall, W., and Schaeffer, R. (which you may already have used for STAT/MATH 511), but I will not use the book to teach this class.

Grading

The graded components of the course are the following:

Homework (25%) There will be 9 homework assignments. The lowest two homework scores will be dropped in the calculation of the course grade. No late homework will be accepted. Homework will be submitted on Blackboard.

Exam I (25%): Will be posted at the end of class on **Thursday, July 1st** and will be due in Blackboard by **Friday, July 2nd** at midnight.

Exam II (25%): Will be posted at the end of class on **Thursday, July 15th** and will be due in Blackboard by **Friday, July 16th** at midnight.

Final exam:

- **Written component (15%)**: Will be posted after class on **Thursday, July 29th** and will be due in Blackboard by **Friday, July 30th** at midnight.
- **Oral component (10%)**: You will be orally quizzed by the instructor during a 20 minute Zoom appointment to be scheduled sometime on **Friday, July 30th**.

If the final exam score (written + oral) is higher than the lower of the two in-semester exam scores, the final exam score will replace that in-semester exam score in the calculation of the course grade.

All assignments and exams are to be *uploaded as single pdf documents*. One way you can do this is by using a smartphone app to take pictures of your hand-written work and to merge them into a pdf (there are various cost-free apps that do this). Or you can use a scanner if you have access to one.

The thresholds 90%, 87%, 80%, 77%, 70%, 67%, and 60% will be used to determine the assignment of the letter grades A, B+, B, C+, C, D+, and D, respectively. A grade of F will be assigned to those earning less than 60%.

To find important dates about withdrawal from the course etc., go to [this link](#).

Honor code

See the Carolinian Creed in the Carolina Community: Student Handbook Policy Guide. Violations of the USC Honor Code may result in a 0 for the work in question, and, in accordance with University policy, other punishments up to and including expulsion from the University.

Accommodations

If you require special accommodations, they must be arranged in advance through the Office of Student Disability Services in room 112A LeConte (777-6142, TDD 777-6744, sasds@mailbox.sc.edu).