# STATISTICS 6860
# SPRING 2023

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**Office Hours:** Monday, 3:00 – 4:00, Wednesday, 11:30 – 12:30, and by appointment

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**Text:** *Matrix Algebra from a Statistician's Perspective,* D. A. Harville, Springer.
The book is available on Amazon and from Springer. Both softcover print and electronic formats are available. I have been told that there is a version that is free to download, though I haven't found it.

The text for the course is an excellent book, but it has not been written with a course in mind. Instead, it has been written as a reference book and it contains a wealth of useful results. This text was chosen for the course because it is one you can read with only a standard undergraduate course on linear algebra as background (i.e., no need for a big linear algebra background, no need for complex analysis, and no need for a huge statistics background) and because it is a great book to have on your bookshelf.

**Course Description:** This course is designed to get you ready for the linear models course. Our course on the linear model is in the second year of the PhD program and MS program (programs in Statistics, that is). Some of the results will also prove useful for your first year applied course that covers multiple linear regression. While you have all seen linear algebra in undergraduate coursework, the typical course is taught with the goals of mathematics in mind. In Statistics, different parts of linear algebra are more important, and we will spend time on some of these areas. Particular examples include the emphasis in Statistics on covariance matrices (square, symmetric, non-negative definite), projections and successive projections as they relate to least squares fits of a model, and the ordering of matrices that is useful for optimal design. During the course, we will review basic concepts of linear algebra and we will build connections to formal statistical models and methods–in particular to the multivariate normal distribution and to the linear model, as well as to least squares and related techniques. As we have only a half-semester, be prepared to read. The course will move quickly.

**Prerequisites:** Enrollment in the PhD program in Statistics or Biostatistics or permission of the instructor.

**Grading:** Course grades will be assigned on the basis of performance on homework assignments, a midterm exam, and the final exam. The intended percentage of your final numerical score assigned to each of these three segments of work is

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| Homework | 30% |
| Midterm | 30% |
| Final | 40% |

I may make adjustments to the grading scheme if, in my judgement, adjustments are warranted.

This course is a half-semester course. The midterm exam will be given on **Tuesday, February 7**. The midterm will be approximately 1 hour. It will cover material from chapters 1 through 8 and 10 through 12 of the text as well as material from the lectures (possibly adjusted, depending on the pace of the lectures). The final exam will be given at the scheduled exam time–that is, during the last class period on **Tuesday, February 28**, from from 12:40 – 2:30. It will be a comprehensive exam, though more weight will be given to post-midterm material.

The COVID situation will dictate the format of the exams. They are quite likely to be in person exams, but if case rates or the severity of cases spike up, they may be online.

If you have a question about the grading of an exam or homework assignment, please write a brief note explaining your question, attach it to the front of the assignment, and turn it in to the instructor (me). I will quickly get back to you with a response.

**Exam rules:** The intended format for the exams is closed-book, closed-notes.

**Homework assignments:** Homework will be collected approximately weekly, making for 6 homework assignments. Homework solutions will be made available on-line at the course web-site. Homework will be accepted late, but points will be deducted for turning the homework in late. The deduction for one day late is 10% of the possible points on the assignment. Homework will not be accepted more than one day late or after the solutions are available. A subset of problems from each assignment will be graded.

Given the nature of the homework, handwritten homework assignments are fine. Scan and upload as a pdf. Please write neatly, as the TA is grading other courses as well as this one.

**Web Site:** There is a course web-site for STAT 6860 on Carmen. Check there for class documents, including homework assignments (and this syllabus!).

**Academic Honesty:** Don't cheat. For exams, this seems a clear enough guideline. For homework, you can talk about problems and work together, but make sure that the write-up is your own. Solutions to many (perhaps all) of the homework problems are readily available. Finding solutions online or in printed form and copying them is cheating.

**Miscellaneous:** If you have any questions or concerns, please let me know of them.