Course Overview and Objectives: This course introduces the mathematical concepts and methods essential for multivariate statistical analysis. Mathematical topics include reviews of basic calculus and linear algebra, eigenvalues and eigenvectors, quadratic forms, vector and matrix differentiation, and optimization. Applications in multivariate statistical analysis include multiple regression, principal component analysis, factor analysis, and spatial analysis (optional).

Required Texts:


Recommended:


Grading*:

Homework Assignments: 50%
Final Exam/Project: 50%
* Plus/minus grades will be assigned for the final grade.

Class Web Site:

Blackboard ([https://courses.utexas.edu/webapps/login/](https://courses.utexas.edu/webapps/login/))

Students with Disabilities:

Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259. For more information, visit [http://www.utexas.edu/diversity/ddce/ssl/](http://www.utexas.edu/diversity/ddce/ssl/).

University Honor Code:

[http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html](http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html)
Accommodations for Religious Holidays:

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Emergency Evacuation Policy:

Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.

Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.

Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.

In the event of an evacuation, follow the instruction of faculty or class instructors.

Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.

Behavior Concerns Advice Line (BCAL): 232-5050
Emergency Information Web Site: http://www.utexas.edu/emergency

Course Outline and Reading Assignments:
(#: articles available online, at the library, or upon request - for duplicating)

Week 1-2: Matrix Algebra: Basic Operations

# Johnston, 4.1
# Fox, 1.1-1.3
Chiang & Wainwright, 4
Carroll & Green, 1-2

Week 3-4: Matrix Algebra: Determinant, Rank, and Inverse
Matrix Representation of the Classical Linear Regression Model

# Johnston, 4.2-4.4
# Fox, 1.4
Chiang & Wainwright, 5
Carroll & Green, 3-4
Week 5-6: Matrix Algebra: Eigenvalues & Quadratic Forms
Bivariate and Multivariate Normal Distribution

# Johnston, 4.5-4.6
# Fox, 1.5-1.6
Carroll & Green, 5-6

Week 7-8: Differential Calculus: Basics

# Fox, 2.1-2.3, 2.7
Chiang & Wainwright, 6-7; 10

Week 9: Spring Break (No Class)

Week 10-11: Matrix Differentiation & Optimization

# Johnston, 4.2; 4.7
# Fox, 2.4-2.6
Chiang & Wainwright, 8-9; 11
Carroll & Green, A.3-A.5

Week 12: Optimization with Equality Constraints

# Johnston, 4.7
# Fox, 2.5.2
Chiang & Wainwright, 12

Week 13-14: Statistical Estimation: OLS, GLS, & MLE

# Fox, 4

Week 15-16: Principal Component Analysis & Factor Analysis


Final Project Due: Wednesday, May 9, at Noon.
Optional Topics

* Spatial Analysis: The Cahoon-Hinich Methodology


* Spatial Analysis: The Aldrich-McKelvey Methodology