

# STA 70500: MULTIVARIATE STATISTICAL METHODS

Spring 2025

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<b>Class Location:</b>	VC 11-217
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<b>Class Time:</b>	Monday, 10:00am-12:00pm
<b>Office Hour:</b>	Monday 12:30pm-1:30pm or by appointment

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## Course Description:

Multivariate statistical methods play a crucial role in business and social science research. This course offers a comprehensive overview of widely used multivariate statistical techniques, tailored for Ph.D. students in Business. The course provides students with foundations of multivariate statistical methods and with working knowledge of applying these methods to real-world problems of their own fields. Topics include but are not limited to the multivariate normal distribution, multivariate linear model, analysis of variance, principal components analysis, discriminant analysis, factor analysis, and canonical correlation. The course emphasizes both the underlying mathematical principles and their practical applications. Therefore, a solid understanding of statistics and mathematics is required.

## Course Materials:

1. **Textbook:** Rencher, *Methods of Multivariate Analysis*, Wiley (2nd edition).
2. **Other useful books:**
  - Johnson, A. and Wichern, D. *Applied Multivariate Statistical Analysis*, Prentice Hall (sixth Edition).
  - Hair et. al, *Multivariate Data Analysis*, Cengage (eighth edition).
  - Anderson, T.W. *An introduction to multivariate statistical analysis*, Wiley (third edition)
  - Wilkinson, D. J., *Multivariate Data Analysis*. [Downloadable](#).
3. **Class note:** Additional notes will be provided.
4. **Software:** R (primary), Stata, SAS and Python (acceptable).
5. All other materials, such as code and additional readings, are distributed to the Blackboard.

## Requirements:

1. Homework Assignments (25%)
  2. Group Project (25%)
  3. Term Project (25%)
  4. Final Exam (25%)
- **Homework Assignments.** Homework assignments are designed to help you to understand the materials covered in class. These assignments will involve solving statistical problems and conducting data analysis exercises using R. You are expected to work through the problems both manually and with R, where applicable, to gain a deeper understanding of the concepts.

- Group Project. Groups are expected to read, discuss, and present a selected paper. The focus should be on the application of multivariate statistical analysis tools across various fields. Key points to address include:
  - What is the motivation behind the study?
  - What is the research design?
  - How are the multivariate data analyses conducted?
  - Are the methods appropriate for the research questions?

Groups may select papers from the following list: [Doll et al. \(1994\)](#); [Liu et al. \(2019\)](#); [Minson et al. \(2020\)](#); [Srinivasan et al. \(1989\)](#); [Chatterjee et al. \(1991\)](#); [Danaher and Smith \(2011\)](#); [Dzyabura et al. \(2019\)](#); [Danaher \(2007\)](#); [Liu and Miller \(2023\)](#); [Jones et al. \(2023\)](#); [Lundrigan and Canter \(2001\)](#); [Zvonkovich et al. \(2023\)](#).

## Recommended Papers

- Chatterjee, S., Jamieson, L., and Wiseman, F. (1991), “Identifying most influential observations in factor analysis,” *Marketing Science*, 10, 145–160. [2](#)
- Danaher, P. J. (2007), “Modeling page views across multiple websites with an application to internet reach and frequency prediction,” *Marketing Science*, 26, 422–437. [2](#)
- Danaher, P. J. and Smith, M. S. (2011), “Modeling multivariate distributions using copulas: Applications in marketing,” *Marketing science*, 30, 4–21. [2](#)
- Doll, W. J., Xia, W., and Torkezadeh, G. (1994), “A confirmatory factor analysis of the end-user computing satisfaction instrument,” *MIS quarterly*, 453–461. [2](#)
- Dzyabura, D., Jagabathula, S., and Muller, E. (2019), “Accounting for discrepancies between online and offline product evaluations,” *Marketing Science*, 38, 88–106. [2](#)
- Jones, A. C., Batastini, A. B., Patel, M. B., Sacco, D. F., and Warlick, C. A. (2023), “Does convenience come with a price? The impact of remote testimony on perceptions of expert credibility,” *Criminal Justice and Behavior*, 50, 197–215. [2](#)
- Liu, L. and Miller, S. L. (2023), “Reclaiming parenthood after incarceration: The nexus of determination to desist, fulfillment of parental responsibilities, and recidivism,” *Criminal Justice and Behavior*, 50, 870–890. [2](#)
- Liu, X., Zhang, B., Susarla, A., and Padman, R. (2019), “Go to YouTube and call me in the morning: Use of social media for chronic conditions,” *MIS quarterly*, 257–283. [2](#)
- Lundrigan, S. and Canter, D. (2001), “A Multivariate Analysis of Serial Murderers’ Disposal Site Location Choice,” *Journal of Environmental Psychology*, 21, 423–432. [2](#)
- Minson, J. A., Chen, F. S., and Tinsley, C. H. (2020), “Why wont you listen to me? Measuring receptiveness to opposing views,” *Management Science*, 66, 3069–3094. [2](#)
- Srinivasan, V., Abeele, P. V., and Butaye, I. (1989), “Note-The Factor Structure of Multidimensional Response to Marketing Stimuli: A Comparison of Two Approaches,” *Marketing Science*, 8, 78–88. [2](#)
- Zvonkovich, J., Kleiman, M., Hester, R., and Strange, C. C. (2023), “The Impact of COVID-19 on Sentencing Practices,” *American Journal of Criminal Justice*, 48, 921–944. [2](#)

- **Term Project.** Term project is assigned for the purpose of applying methods covered in class to real problems. Students are required to use a database on a topic of their choice. Ideally, students should develop a research hypothesis based on the domain knowledge and use multivariate techniques to test the hypothesis. Students are required to do a presentation based on the project at the end of the semester.
- **Final Exam.** The purpose of the final exam is to assess students' understanding of the concepts and techniques covered in class. The exam will be conducted in-class during Baruch's designated exam period and will be open book, open notes, and open computer.

### Tentative Topics:

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January 27	Introduction to R and Matrix Algebra
February 3	Random vector, random samples
February 10	The multivariate Normal distribution
February 17	<b>No class, President's day</b>
February 18	Inference about a mean vector (hypothesis test and confidence interval)
February 24	Comparison of several multivariate means (MANOVA)
March 3	MANOVA and covariance matrices
March 10	Discriminant Analysis
March 17	Classification Analysis
March 24	Principal Component Analysis
March 31	Factor Analysis
April 7	Structural Equation Models. <i>Group 1 Project Presentation</i>
April 14	<b>No class, spring break</b>
April 21	Structural Equation Models, <i>Group 2 Project Presentation</i>
April 28	Cluster Analysis, <i>Group 3 Project Presentation</i>
May 5	Categorical Data Analysis, <i>Group 4 Project Presentation</i>
May 12	Term Project Presentations

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### Students with Disabilities:

Students with disabilities may receive assistance and accommodation of various sorts to enable them to participate fully in courses at Baruch. To establish the accommodations appropriate for each student, please alert me to your needs and contact the Office of Services for Students with Disabilities, part

of the Division of Student Development and Counseling. For more information contact the office in NVC 2-271 or at (646)-312-4590.

**Mental Health:**

At Baruch, we acknowledge that as a student, you are balancing many demands. During the semester, if you start to experience personal difficulties or stressors that are interfering with your academic performance or day to day functioning, please consider seeking free and confidential support at the Baruch College Counseling Center. For more information or to make an appointment, please visit their website at <https://studentaffairs.baruch.cuny.edu/counseling/> or call 646-312-2155. If it's outside of business hours (Monday-Friday 9-5pm) and you need immediate assistance, please call 1-888-NYC-WELL (888-692-9355). If you are concerned about one of your classmates, please share that concern by filling out a Campus Intervention Team form at <https://studentaffairs.baruch.cuny.edu/campus-intervention-team>.

**Academic Integrity:**

Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism and collusion in dishonest acts undermine the college's educational mission and the students' personal and intellectual growth. Baruch students are expected to bear individual responsibility for their work and to uphold the ideal of academic integrity. Any student who attempts to compromise or devalue the academic process will be sanctioned.

Students are responsible for completing all exams without assistance from others, either voluntary or involuntary. No communication among students during exams is allowed. If you have a question regarding the wording of a problem, you may ask instructor to help you. Note that, helping somebody else cheat is a form of academic dishonesty. Please see the Baruch College Website for Further Information:

[http://www.baruch.cuny.edu/academic/academic\\_honesty.html](http://www.baruch.cuny.edu/academic/academic_honesty.html).