

SC705: ADVANCED STATISTICS

Webpage: <http://www.sarkisian.net/sc705>

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COURSE DESCRIPTION

This applied course is designed for graduate students with a prior background in statistics at the level of SC703: Multivariate Statistics (or its equivalent). This means that students should have considerable experience with multiple regression and an ability to conduct such analyses using some statistical software. The major topics of the course will include hierarchical linear modeling and structural equation modeling. We will use HLM 7 and LISREL 8.8.

The goals of the course are to develop the skills necessary to identify an appropriate technique, estimate models, and interpret results for independent research and to critically evaluate contemporary social research using advanced quantitative methods. The course will be applied in the sense that we will focus on estimating models and interpreting the results, rather than understanding in detail the mathematics behind the techniques. I hope that the course will provide you with a solid foundation in advanced quantitative methods, which is in high demand in many fields, both in and out of academia. For those of you in the Sociology Department, the course can also provide a foundation for the “Advanced Quantitative Methods” area examination.

COURSE POLICIES

For each topic in the course, I will give a lecture focusing on the reasoning behind the techniques and an interactive review of the syntax used to do the analyses as well as the generated output. Throughout that process, you will get a chance to practice conducting the analyses and interpreting the results. We will also discuss and critically evaluate published research based on the various techniques. Make sure that you carefully read these examples of published research before class and be prepared to discuss them. The course is based on an interactive relationship between the instructor and students, as well as on collaboration among the students. You are strongly encouraged to ask questions and discuss the material in class. I also encourage collaboration among the students. Please feel free to help each other when running analyses for assignments. However, everyone must turn in their own report and statistical output.

I also would like to stress that you are always welcome to come and see me with any additional questions. If I am not in my office, email is the best way to get in touch with me – I check my email very often. Also, please check the course website regularly: typically, each week I will post course notes for you to print out. And make sure to check your email, too – from time to time I may send some announcements.

Finally, a note on feedback. I would like to know how I could make this course experience as useful and interesting as possible. Therefore, every week in the end of class I will ask you to submit a sheet of paper with the date and at least one sentence of reaction to that class meeting,

indicating what you learned, or something you liked or did not like, found interesting or controversial, found clear or too simplistic, or found confusing and in need of further (or better) explanation. You may also submit comments on the course in general.

REQUIRED MATERIALS:

Books:

The following books should be available for purchase at the BC bookstore. They are also placed on reserve at the library.

1. Hox, Joop. 2010. *Multilevel Analysis: Techniques and Applications*. 2nd edition. Routledge.
2. Kline, Rex B. 2010. *Principles and Practice of Structural Equation Modeling*. 3rd edition. New York: The Guilford Press.

Other readings:

Other required readings (listed below in the course outline) will be available on electronic reserve in the library: see <http://www.bc.edu/reserves>.

COURSE REQUIREMENTS AND GRADING:

There will be two large data analysis assignments (one on HLM, one on SEM), one article write-up (on either HLM or SEM), and two smaller assignments that involve answering questions about published articles. Each major assignment will consist of two drafts, to be submitted electronically (by email or using MyFiles). If you turn in the first draft by the due date, I will comment on it, assign a temporary grade, and return it to you. At that point, we will also discuss the common problems. You will then get a chance to submit a revised draft. If you are satisfied with your temporary grade, you do not need to revise the assignment – just let me know.

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|-----------------------|-------------------|--|
| HLM Analysis | 35% of your grade | 1 st Draft due 10/16, Final Draft due 11/06 |
| SEM Analysis | 35% of your grade | 1 st Draft due 11/20, Final Draft due 12/04 |
| HLM Article Responses | 5% of your grade | Due before class on 10/09 |
| SEM Article Responses | 5% of your grade | Due before class on 11/27 |
| Article Write-up | 20% of your grade | 1 st Draft due 12/4, Final Draft due 12/18 |

The data analysis assignments will involve selecting a research question and variables, running analyses, and briefly interpreting the results. I will provide data, although you can use your own data if they are appropriate for the technique (see me in advance). Article assignment will involve writing up the results of one of the two data analyses like you would for a journal publication (including introduction, data and methods, and results sections). My hope is that these assignments will facilitate your own independent research projects, so try to select your own data and research questions if possible.

The letter grades for the final drafts of your assignments will be determined as follows:

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|--------|----|
| 93-100 | A |
| 90-92 | A- |
| 87-89 | B+ |
| 83-86 | B |
| 80-82 | B- |
| 60-79 | C |
| 0-59 | F |

COURSE OUTLINE.

September 4: Introduction to the Course and to Hierarchical Linear Modeling (HLM)

September 11: Two-Level HLM Models

Hox, Joop. 2010. Chapters 1 and 2 from *Multilevel Analysis: Techniques and Applications*. 2nd edition. Routledge.

Raudenbush, Stephen W., Bryk, A.S, and Congdon, R. 2004. Chapters 2, 12 from *HLM 6: Hierarchical Linear and Nonlinear Modeling*. Scientific Software International, Inc. [e-reserve]

September 18: HLM Model Building Strategies

Hox, Joop. 2010. Chapters 3 and 4 from *Multilevel Analysis: Techniques and Applications*. 2nd edition. Routledge.

September 25: HLM Diagnostics

Snijders, Tom A. B., and Roel J. Bosker. 2011. Chapter 10 from *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. 2nd edition. Thousand Oaks, CA: Sage. [e-reserve]

October 2: HLM Models for Categorical and Count Data

Hox, Joop. 2010. Chapter 6 and 7 from *Multilevel Analysis: Techniques and Applications*. 2nd edition. Routledge.

Snijders, Tom A. B., and Roel J. Bosker. 2011. Chapter 17 from *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. 2nd edition. Thousand Oaks, CA: Sage. [e-reserve]

October 9: HLM in Published Research

*****HLM Journal Article Responses Due*****

Huffman, Matt L. 2004. "More Pay, More Inequality? The Influence of Average Wage Levels and the Racial Composition of Jobs on the Black–White Wage Gap." *Social Science Research*, 33, 498–520. [e-reserve]

October 16: Introduction to Structural Equation Modeling (SEM)

*****HLM Assignment first draft due*****

Kline, Rex B. 2010. Chapters 1-4 from *Principles and Practice of Structural Equation Modeling*. 3rd edition. New York: The Guilford Press.

October 23: Introduction to LISREL

Byrne, Barbara M. 1998. Using LISREL, PRELIS, and SIMPLIS. Chapter 2 (pp.43-87) from *Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS*. Mahwah, NJ: Erlbaum. [e-reserve]

Kline, Rex B. 2010. Chapters 5-6 from *Principles and Practice of Structural Equation Modeling*. 3rd edition. New York: The Guilford Press.

October 30: Model Building Strategies

Kline, Rex B. 2010. Chapters 7-8 from *Principles and Practice of Structural Equation Modeling*. 3rd edition. New York: The Guilford Press.

November 6: SEM with Latent Variables

****HLM Assignment final draft due****

Kline, Rex B. 2010. Chapters 9-10 from *Principles and Practice of Structural Equation Modeling*. 3rd edition. New York: The Guilford Press.

November 13: Diagnostics and Hypothesis Testing

Kline, Rex B. 2010. Chapter 13 from *Principles and Practice of Structural Equation Modeling*. 3rd edition. New York: The Guilford Press.

November 20: No class

****SEM Analysis first draft due****

November 27: SEM in Publications

****SEM Journal Article Responses due****

Hoyle, Rick H. and Abigail T. Panter. 1995. "Writing about Structural Equation Models." Chapter 9 from Rick H. Hoyle (editor), *Structural Equation Modeling: Concepts, Issues, and Applications*. Thousand Oaks, CA: Sage Publications. [e-reserve]

Beth A. Kotchick, Shannon Dorsey, and Laurie Heller. 2005. "Predictors of Parenting among African American Single Mothers: Personal and Contextual Factors." *Journal of Marriage and Family*, 67, 448-460. [e-reserve]

December 4: Longitudinal Models in HLM and SEM

****SEM Analysis final draft and Article Write-Up first draft due****

Kline, Rex B. 2010. Chapter 11 from *Principles and Practice of Structural Equation Modeling*. 3rd edition. New York: The Guilford Press.

Maruyama, Geoffrey M. 1998. Chapter 6 from *Basics of Structural Equation Modeling*. Thousand Oaks, CA: Sage Publications. [e-reserve]

Hox, Joop. 2010. Chapters 5 and 16 from *Multilevel Analysis: Techniques and Applications*. 2nd edition. Routledge.

December 11: Missing Data and Multiple Imputation

Johnson, David R., and Rebekah Young. 2011. "Toward Best Practices in Analyzing Datasets with Missing Data: Comparisons and Recommendations." *Journal of Marriage and Family*, 73, 926-945. [e-reserve]

December 18: No class

****Article Write-Up final draft due****