Sociology 902—Structural Equation Models

Classroom	707 Oldfather Hall
Lab	738 Oldfather Hall
Schedule	**F: 2:00-4:30pm**
Instructor	Jacob E. Cheadle
Office	737 & **824** Oldfather Hall
Telephone	402-472-6037
Email	j.e.cheadle@gmail.com
Website	http://blackboard.unl.edu
Office Hours	R 1-3 pm
	By appointment

Prerequisites for this class are SOC 862 (or an equivalent class on basic or intermediate regression analysis) and SOC 463 (or an equivalent research methods class). It is strongly recommended that students have had at least one other graduate statistical course before taking this course (e.g., a class on correlation and regression).

1 About This Course

This course will introduce Structural Equation Modeling (SEM) with and without latent variables. It provides an overview of the statistical theory underlying SEM and practice with the Stata software package. Topics include path analysis, confirmatory factor analysis, incorporating multiple indicators and measurement error into structural models, alternative estimators for categorical and limited dependent variables, model identification, model fit assessment, growth curve modeling, and some teasers for more advanced topics. This course is intended for graduate students in sociology and related disciplines. The course assumes a thorough understanding of statistical inference, ordinary least-squares regression, and regression models with non-normal or discrete dependent variables (which may be taken concurrently). Computer assignments are a part of the course, so students should be familiar with Stata.

2 Course Readings

2.1 Main Readings

The following two books are required for the course:

- Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling, Fourth Edition*. New York: Guilford.
- Hancock, G.R. & Mueller, R.O. (2010). *The Reviewer's Guide to Quantitative Methods in the Social Sciences*. New York: Routledge.

2.2 Supplemental Readings

In addition, you may also utilize:

- StataCorp. 2013. *Stata Structural Equation Modeling Reference Manual. Release 15*. College Station, TX: StataCorp LP.
- Muthén, B., & Muthén, L. (2010). *Mplus User's Guide* (6th ed.). Los Angeles: Muthén &

Muthén.

Additional course readings are available for download at the course website (http://blackboard.unl.edu) under "Course Documents." If you need additional information on Stata, you may want to check out *A Gentle Introduction to Stata* by Alan C. Acock.

2.3 Additional Resources

The following online resources may be helpful throughout the course:

- www.statmodel.com
  The website for Mplus includes examples of syntax and output, technical appendices, powerpoints from Mplus trainings, and a discussion board. I recommend you explore this site—it has many resources for Mplus users.
- http://davidakenny.net/cm/causalm.htm
  Statistician David Kenny has helpful introductions to and examples of SEM concepts at this website.
- http://www.ats.ucla.edu/stat/seminars/default.htm
  UCLA Institute for Digital Research and Education, Statistical Consulting Classes and Workshops has a lot of great online workshops for Mplus (and a lot of other statistical programs).

3 Lab & Software Access

All classes will first meet in 707 Oldfather Hall and we will migrate together to 738 as needed. Stata can be accessed through the Departmental Compute Server (Soc-Analyzer) via remote desktop. Remember, when you are done with a session to "log off" and not to simply close the remote desktop client. There are also options available to you for purchasing your own Stata 14 license for the semester, or into perpetuity. Both Stata/IC or Stata/SC are fine for the course (MP is certainly not needed).

Purchasing: http://www.stata.com/order/new/edu/gradplans/campus-gradplan/

4 Assessment

Your final grade in this course will be based upon the following factors:

1. Paper Assignments, labeled P1-P3.
2. Homework Assignments, indicated H1-H5.

The point distribution is as follows:

Assignment	Points
P1	10
P2	10
P3	75
H1-H5 (10pts)	50
Total =	145

At the beginning of the semester, you have 0 points. Over the semester, you will have multiple opportunities to acquire points. The point-grade distribution is as follows:

Letter Grade	Percentage
A+	100% or more
A	93%-99%
A-	90%-92%
B+	87%-89%
B	83%-86%
B-	80%-82%
C+	77%-79%
C	73%-76%
C-	70%-72%
D+	67%-69%
D	63%-66%
D-	60%-62%
F	0%-59%

4.1 Paper Assignments

The final project for the course will involve using structural equation modeling to answer a research question of interest to you. My goal is that you will use data that you are currently working with, although we can discuss dataset possibilities if you do not have access to a relevant dataset for your analyses.

The final paper should be the length of a brief report at minimum (approximately 12-15 pages [not including tables, figures, or references], 12pt Times New Roman Font, double spacing, 1" margins, all references in ASR style). The paper will be developed in three parts.

> **P1 - Due 9/29**: Write a one- to two-page summary of the proposed paper topic. The summary should include a brief summary of the existing literature informing the study, a brief description of the dataset to be used, identification of the research questions and related hypotheses, and a short description of the proposed analysis plan.
>
> **P2 – Due 11/10:** This is the first draft of your paper. It should include a 3-4 page Introduction/Literature Review (including a conceptual model), a 3-4 Method section (standard sections, including an Analysis Plan), and a reference list. Although not required for Part 2, it would be useful to include a table of the correlations and descriptive statistics for the primary variables of interest.
>
> **P3 – Due 12/8:** This is the final draft of your paper. It should include a revised Introduction and Method sections, a 2-3 page results section, a 3 or more page Discussion section, and a reference list. You must also submit exemplar output from the software that you are using in an attached Appendix.

4.2 Assignments

Assignments (both Paper Project and Homework) are posted online at our classroom Canvas site. They will generally provide an upload link that you can use. All assignments are due on the day indicated above in the calendar at 2pm (the beginning of class). Since all assignments will be uploaded to Canvas as Word documents (please download and review each assignment *well in advance*), the upload fields have timers and so have a closing date. Assignments will not be excepted via email except in emergencies, and possibly with a loss of points.

- All assignments in this class are to be based on independent, not group or collaborative, work unless specifically noted in the assignment.
- All homework and written assignments must use 12-point Times New Roman font for text, 10-pt Courier New for Stata code, be single-spaced, and include your last name and the page number on all pages.
- All homework must include your annotated Stata output file in solutions where appropriate, or otherwise as an Appendix using Comments to indicate which bits of code address which question. Include your last name and page numbers on all pages.
- Each homework and written assignment is due at the beginning of class (2pm) on the day indicated in the calendar.
- If you anticipate that you will need special accommodations in the completion of an assignment, please email me or talk with me privately as early in the semester as possible.

5 Disability Access

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

6 Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic dishonesty includes cheating, fabrication or falsification of student work, plagiarism, complicity in academic dishonesty, misrepresentation to avoid academic work, and failure to properly report any information regarding academic dishonesty. Examples include copying or allowing others to copy solutions from unauthorized sources (such as other students, textbooks, or the Internet), unauthorized collaboration with others (including tutors, TAs, and helpdesk staff), and modifying or deleting the files of others. So please don't do any of that ☹ Students caught breaking these rules will be referred to the Office of Student Judicial Affairs.

7 Calendar

	Date	Topic	Reading	Due
1	8/25/17	Intro to SEM	Hancock & Mueller ch 28 Kline ch 1	
2	9/1/17	Review and introduction to Stata	Kline ch 2 Kline ch 3 Stata SEM Manual	
3	9/8/17	Path Analysis	Kline ch 6 Kline ch 7	
4	9/15/17	Testing mediation and indirect effects	Baron & Kenny, 1986 MacKinnon et al., 2007 Hayes, 2009 Muller et al 2005	HW-1
5	9/22/17	Latent Variables: EFA/CFA	Kline ch 9 Hancock & Mueller ch 8	
6	9/29/17	Global Fit Testing	Kline ch 11 Kline ch 12	HW-2
7	10/6/17	SEM 1	Kline ch 13	P-2
8	10/13/17	SEM 2	Klline ch 14	HW-3
9	10/20/17	Missing data approaches (FIML, imputation)	Enders ch 2 Enders, 2006 Allison 2003	HW-4
10	10/27/17	Mean Structure & Growth Curve Models	Hancock & Mueller ch 14 Kline ch 15	
11	11/3/17	Multigroup SEM	Hancock & Mueller ch 129 Kline ch 16	HW-5
12	11/10/17	Interaction Effects & Multilevel SEM	Kline ch 17	P-2
13	11/17/17	Categorical Latent Variables	Hancock & Mueller ch 13, 14, 15, 16	
14	11/24/17	Thanksgiving		
15	12/1/17	Special Topics	TBD	
16	12/8/17	Final Paper Due		Final Paper (P3)