

**SOC 6810 - Advanced Multivariate Analysis  
Fall 2009**

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**Class:** Thursday 4-6:20  
2207 Sangren

**Office hours:** Tuesday 2-7:30, after class, and by appointment

**Content:** This course will cover four general topics/units: hierarchical (multilevel) linear and generalized linear modeling; modeling change; structural equation modeling (SEM); and modeling event occurrence. All course materials, including lecture notes, will be available from Blackboard/Vista.

**Prerequisite:** SOC 6210 or an equivalent course on applied regression analysis.

**Required texts:**

The following **required** texts are available from the WMU Bookstore.

Kline, Rex B. 2004. *Principles and Practice of Structural Equation Modeling*. Second Edition. New York: Guildford Press.

Luke, Douglas A. 2004. *Multilevel Modeling*. Thousand Oaks, CA: Sage Publications.

Singer, Judith D. and John B. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York: Oxford University Press.

The following **recommended** texts are available from the WMU Bookstore.

Allison, Paul D. 1991. *Logistic Regression Using the SAS System*. Cary, NC: SAS Institute.

Hox, Joop J. 2002. *Multilevel Analysis: Techniques and Applications*. Mahwah, NJ: Lawrence Erlbaum Associates. (also available from the e-brary database through the WMU library)

Raudenbush, Stephen W. and Anthony S. Bryk. 2002. *Hierarchical Linear Models: Applications and Data Analysis*. Thousand Oaks, CA: Sage Publications.

**Software:**

For structural equation modeling and event occurrence modeling, we will be using SPSS 17.0 and Amos 17.0. These are available on computers in the sociology department's lab. You can purchase the SPSS 17.0 full Graduate Pack (which includes Amos 7.0) for \$188 plus \$20 s/h from Total Tech in the WMU Bookstore. The Graduate Pack can also be rented (\$79.99 6-month rental or \$139.99 12-month rental) from [www.e-academy.com](http://www.e-academy.com). The student version of Amos 5.0 can be downloaded from [www.amosdevelopment.com/download/index.htm](http://www.amosdevelopment.com/download/index.htm) However, the student version is limited to 8 observed variables and 54 total parameters.

For multilevel modeling, we will use HLM 6.06 (and maybe SAS and SPSS). The student version can be downloaded from here <http://www.ssicentral.com/hlm/student.html>. It is limited to the following for three-level models: 7500 observations at level 1, 1700 observations at level 2, and 60 observations at level 3. For two-level models there are the following limitations: 7500 observations at level 1 and 350 observations at level 2. There may not be more than 5 effects at any level of the model, nor more than 25 total effects overall. If you require more observations/effects, then you may want to consider renting a copy of HLM 6.06. The 6-month rental is \$70, and the 12-month rental is \$120. The software rentals can be purchased and downloaded from [www.e-academy.com](http://www.e-academy.com). The SSI Central website also has a free 15-day trial for HLM 6.06.

### **Course Requirements:**

Forty percent of your course grade will be based on exercises that are designed to give you practice using the techniques covered in class. Most of these exercises will involve annotated replications (and perhaps an extension) of the text/lecture examples where you generate your own copy of the output and add annotations to the output that interpret the results. These will be graded pass/fail. **The exercises for each unit will be due the week following completion of the unit's material. I will comment on, but not give credit for, late materials.** Feel free to work together on these exercises, and consult with me as you do your work. I strongly suggest that you keep up with the work each week, completing the replications as close to the time they were covered in class as possible. **It is important not to fall behind.**

The remaining 60 percent of your course grade will be based on a term paper/conference paper where you will use one or more of the techniques we cover to analyze your data, and presentation of your results to the class. These data may come from ICPSR, or might be the data you are analyzing in your master's thesis or dissertation. As I will stress in class, your model will be theoretically-based, and will be developed from a review of the literature. You will write up the paper in journal article format, including tables of results. Please use the American Sociological Association format for references and citations. I have placed a copy of the *ASA Style Guide* on our Blackboard/Vista site. Also, please follow the instructions for manuscript preparation including placing table and figure indicators in the text, and appending endnotes, references, figures, and tables to the paper in the order specified in the *Style Guide*. I will provide examples of SEM and multilevel journal articles for you to follow, as well as a couple of articles that explain how to write up such research. I am hoping that your paper will result in a conference presentation and an article submitted to a peer-reviewed journal. **The term paper will be due December 17<sup>th</sup>.** Please aim to have the paper completed by the due date. If you do need additional time, I will consider awarding an incomplete grade, with the stipulation that the paper be turned in to me no later than January 15<sup>th</sup>.

## **Tentative Schedule:**

### *Unit I. Hierarchical Linear and Generalized Linear Modeling*

#### **September 10 – Introduction to Hierarchical Linear Modeling**

Required Reading: Lukes pp. 1-37

Recommended Reading: Raudenbush and Bryk Chaps. 1, 2, and 4  
Hox Chaps. 1-2

#### **September 17 – HLM Model Diagnostics, Hierarchical Generalized Linear Models, Three-Level Models**

Required Reading: Lukes pp. 37-62

Recommended Reading: Raudenbush and Bryk Chaps. 8-10  
Allison Chaps. 2, 6, and 9  
Hox Chap. 6

### *Unit II. Modeling Change*

#### **September 24 – Introduction to Multilevel Models for Change**

Required Reading: Singer and Willett Chaps. 1-3

Recommended Reading: Lukes pp. 62-72  
Raudenbush and Bryk Chap. 6  
Hox Chap. 5

#### **October 1 – Estimation of Multilevel Models for Change, Comparing Models, Evaluation of Model Assumptions**

Required Reading: Singer and Willett Chap. 4

Recommended Reading: See September 24

#### **October 8 – Calibrating Time in Multilevel Models for Change and Estimation of Nonlinear Change Trajectories**

Required Reading: Singer and Willett Chaps. 5 and 6

Recommended Reading: See September 24

**October 15 – Consideration of Alternative Error Covariance Structures (Moving Beyond Homogeneous Variance Structures) and Using Structural Equation Models to Estimate Growth Trajectories (Latent Growth Modeling)**

Required Reading: Singer and Willett Chaps. 7 and 8

Recommended Reading: See September 24

*Unit III. Structural Equation Modeling*

**October 22 – Path Analysis Revisited**

Required Reading: Kline Chaps. 5 and 6

Recommended Reading: Kline Chaps. 1-4 (good review and background material)

**October 29 – Measurement Models, Confirmatory Factor Analysis, and Hybrid Models**

Required Reading: Kline Chaps. 7 and 8

**No Class November 5 – American Society of Criminology Meeting**

**November 12 – Nonrecursive Structural Equation Models and Multiple Group Analysis**

Required Reading: Kline Chaps. 9 and 11

*Unit IV. Modeling Event Occurrence*

**November 19 – Introduction to Survival Analysis and Describing Discrete-Time Event Occurrence Data**

Required Reading: Singer and Willett Chaps 9 and 10

**December 3 – Fitting and Extending the Discrete-Time Hazard Model**

Required Reading: Singer and Willett Chaps. 11 and 12

[If time permits, we will also cover the issues involved with continuous-time event occurrence models, and estimation of such models covered in Singer and Willett Chaps. 13-15]

**December 10 and 17 – Paper Presentations**