

**The University of Calgary  
Faculty of Social Sciences  
Department of Sociology**

Selected Topics in  
Advanced Quantitative Analysis I  
Sociology 711.01  
Winter, 2008  
**Course Outline**

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### **Course Objectives**

This quarter course represents the first half of a course designed to survey a variety of specific modeling techniques within the generalized linear model that currently dominates quantitative sociological research. In this first part of the course we will examine both structural equation models and measurement models before synthesizing them into structural equation models with latent variables, commonly known as LISREL models. Our approach will be mainly applied and involves reading both technical work and a substantive application on each technique, as well as learning to use computer software to estimate each category of model. The emphasis will be on choosing an appropriate modeling strategy based on theoretical, design, and measurement considerations and the interpretation of parameter estimates and fit statistics.

### **Required Texts**

Jae-On Kim and Charles W. Mueller, *Factor Analysis: What It Is and How To Do It*. Thousand Oaks, California: Sage, 1978.

Paul E. Spector, *Summated Rating Scale Construction*. Thousand Oaks, California: Sage, 1991.

In addition, a number of articles and book excerpts treating specialized topics will be distributed. To supplement the readings on statistical and methodological topics, for each unit we will also read and discuss a substantive article from a recent journal using the techniques taught in the course.

### **A Note on Software**

The main statistical software package to be used in this course is Stata. It is rapidly becoming the standard for sociologists, economists, and other social scientists, as well as biomedical researchers, who are doing serious data analysis. It's main virtue is that, because it is programmable, much of it is designed by users themselves. This means that state-of-the-art statistical procedures are generally available first in Stata. While SPSS or

SAS can do many of the procedures discussed in this course, they will not be supported in the lectures or labs. For full credit, all lab exercises, except for those using other software, must include Stata output.

### **Some Web Resources**

The following are web pages that have substantial amounts of information about Stata and LISREL. The UCLA page in particular is an important tool for learning to use Stata.

[www.stata.com](http://www.stata.com)

[www.ats.ucla.edu/stat/stata/](http://www.ats.ucla.edu/stat/stata/)

[www.ssicentral.com/lisrel/mainlis.htm](http://www.ssicentral.com/lisrel/mainlis.htm)

### **Grading**

Your mark for the course will be based upon an article critique and a paper in which you will be asked to carry out a secondary analysis of some data in a substantive area of interest to you. The paper will comprise 60 percent of your final grade and the article critique 20 percent. In addition, each unit of the course will be accompanied by a computer exercise utilizing statistical software such as Stata, or LISREL. The computer exercises will be worth 20 percent of your final mark. These exercises will be marked on a "pass-fail" basis, with a pass awarded if all questions are attempted. Unsubmitted or incomplete exercises will be awarded a "fail." Exercises are due on the day of the lab to which they apply. None will be accepted late. While you are encouraged to consult with the instructor, lab assistant, and other students in the course in carrying out the labs, *each student must submit his or her own work for marking*. Under this system, you will receive an 'A' for 20 percent of your mark by simply submitting the completed exercises on time. Four percent will be deducted for each exercise not received on time.

### **Lab Fee**

Due to the extensive nature of the handouts in this course, a lab fee of \$15 (cheques payable to the Department of Sociology) will be assessed to defray partially the cost of copying. This will cover not only the lab exercises and supplementary technical readings, but also the substantive articles mentioned above and excerpts from the Stata manuals.

**Exam Policies:** You must provide advance notice to the instructor if you are unable to take an exam. All requests for deferral of an examination due to health reasons must be accompanied by written documentation as outlined in the University Calendar and should be obtained while the student has the physical or emotional problem rather than after recovery. Deferred exams may be allowed in the following circumstances: illness, domestic affliction or religious conviction. If you have missed an exam for a legitimate reason, you will be able to write a "make up" exam as close to the original exam as possible. The date and location will be at the convenience of the Sociology Department. Travel arrangements and misreading of the syllabus are not valid reasons for requesting a deferred exam. Deferred exams will not be granted if it is determined that just cause is not shown by the student.

**Ethics Research:** Students are advised that any research with human subjects--including any interviewing (even with friends and family), opinion polling, or unobtrusive observation--must have the approval of the Departmental Ethics Committee. In completing course requirements, students must not undertake any human subjects research without discussing their plans with the instructor, to determine if ethics approval is required.

**Academic Misconduct:** cheating is regarded as a serious academic offense. Students are advised to consult the University Calendar, which presents a Statement of Intellectual Honesty and definitions and penalties associated with cheating, plagiarism, and other academic misconduct.

**The Freedom of Information and Protection of Privacy (FOIP)** legislation disallows the practice of having students retrieve assignments from a public place, e.g., outside an instructor's office or the Department main office. Term assignments must be returned to students individually, during class, or during the instructor's office hours; if a student is unable to pick up her/his assignment s/he may provide the instructor with a stamped, self-addressed envelope to be used for the return of the assignment.

**Safewalk:** The University of Calgary provides a "safe walk" service to any location on Campus, including the LRT, parking lots, bus zones, and campus housing. For Campus Security/Safewalk call 220-5333. Campus Security can also be contacted from any of the "Help" phones located around Campus.

#### ***Academic Accommodation***

Students with a disability, who require academic accommodation, need to register with the Disability Resource Centre (MC 295, telephone 220-8237). Academic accommodation letters need to be provided to course instructors no later than fourteen (14) days after the first day of class. **It is a student's responsibility to register with the Disability Resource Centre and to request academic accommodation, if required.**

## Handing in Papers Outside of Class, Return of Final Papers, and Release of Final Grades

1. When students are unable to submit papers at class, they should make arrangements to hand in their papers directly to the instructor or teaching assistant rather than at the Sociology Department main office.
2. Final papers will not be returned through the Sociology Department main office. The Freedom of Information and Protection of Privacy (FOIP) legislation disallows the practice of having students retrieve assignments from a public place, (i.e., outside an instructor's office, the department office, etc.). Students who want their final papers returned by mail must attach a stamped, self-addressed envelope with the paper. Otherwise final papers will only be available for pick-up during the instructor's office hours at the end of this term or the beginning of the next term.
3. Final grades are not posted by the Sociology department. They are only available online.

## TENTATIVE CALENDAR

### 1 Introduction: Theory, Model, and Design; Statistical Software

#### *Reading*

Pedhazur, E.J. 1997. *Multiple Regression in Behavioral Research* (Third Edition). Toronto: Harcourt Brace College Publishers, pp. 765-769

\*Adrian E. Raftery. 2001. "Statistics in Sociology, 1950-2000: A Selective Review." *Sociological Methodology 2001* 31:1-45.

#### *Lab Exercise and Reference*

Stata orientation; multiple regression review exercise

J.S. Long and J. Freese. 2006. *Regression Models for Categorical Dependent Variables Using Stata (Second Edition)*. College Station, Texas: Stata Press. (Chapter 2: Introduction to Stata)

### 2 Recent Developments in Statistical Inference: Bayesian Model Selection and Robust Standard Errors

#### *Technical Reading*

Adrian E. Raftery. 1995. "Bayesian Model Selection in Social Research." *Sociological Methodology 25*: 111-163.

Stata 9 User's Guide pp. 275-280. (section on robust standard errors)

#### *Substantive Example*

R. A. Wanner. 2005. "Twentieth-Century Trends in Occupational Attainment in Canada" *Canadian Journal of Sociology* 30: 441-469.

### 3 Structural Equation Models with Observed Variables: Path Analysis

#### *Technical Readings*

Pedhazur, pp. 765-807

D.F. Alwin and R.M. Hauser. 1975. "The Decomposition of Effects in Path Analysis." *American Sociological Review* 40:37-47.

*Substantive Examples*

Terry Boswell and William J. Dixon. 1990. "Dependency and Rebellion: A Cross-National Analysis." *American Sociological Review* 55:540-559.

\*Peter S. Li and Brian D. MacLean. 1989. "Changes in the Rural Elderly Population and Their Effects on the Small Town Economy: The Case of Saskatchewan, 1971-1986." *Rural Sociology* 54: 213-226.

*Lab Exercise and Reference*

Estimation of a path model using Stata `regress`

Stata Reference Manual R-Z pp. 35-57 (entry for `regress`)

**4 Exploratory Factor Analysis***Technical Readings*

Kim and Mueller, *Introduction to Factor Analysis*

\*Kim and Mueller, *Factor Analysis: Statistical Models and Practical Issues*

\*A.C. Rencher. 1995. *Methods of Multivariate Analysis*. New York: John Wiley. Chapters 12 and 13.

*Substantive Example*

Alfred A. Hunter and Michael C. Manley. 1986. "On the Task Content of Work." *Canadian Review of Sociology and Anthropology* 23: 47-71.

*Lab Exercise and Reference*

Estimation of alternative factor models using Stata `factor`

Stata Multivariate Statistics Manual pp. 505-526 (entry for `factor`)

**5 Measurement and Scaling***Technical Readings*

Paul E. Spector, *Summated Rating Scale Construction*.

Thomas Piazza. 1980. "The Analysis of Attitude Items." *American Journal of Sociology* 86 : 594-603.

\*Zeller, Richard A. and Edward G. Carmines. 1980. *Measurement in the Social Sciences*. Cambridge: Cambridge University Press.

*Substantive Example*

J. Phelen, B.G. Link, A. Stueve, and R.E. Moore. 1995. "Education, Social Liberalism, and Economic Conservatism: Attitudes Toward Homeless People." *American Sociological Review* 60: 126-140.

*Lab Exercise and Reference*

Scale construction using Stata `factor` and `alpha`

Stata Reference Manual Vol. 1 pp. 19-24 (entry for `alpha`)

**6 Structural Equation Models with Latent Variables***Technical Readings*

G.M. Maruyama, *Basics of Structural Equation Modeling*, Chapters 8-10

\*Kenneth A. Bollen. 1989. *Structural Equations with Latent Variables*. New York: Wiley.

\*L.A. Hayduk. 1996. *LISREL Issues, Debates, and Strategies* (Second Edition). Baltimore: Johns Hopkins University Press.

*Substantive Example*

P. Wilk. 2001 "Women's Employment Transitions and Changes in Psychological Distress." *Canadian Studies in Population* 28: 513-533

*Lab Exercise*

Estimating a structural equation model using LISREL

LISREL Reference Manual Chapter 2 (Detailed Instructions for the Problem Run)

**7 Some Practical Data Analysis Topics: Bootstrapping, Imputing Missing Values, and Correcting Sample Selection Bias**

*Technical Readings*

\*C.Z. Mooney and R.D. Duval. 1993. *Bootstrapping: A Nonparametric Approach to Statistical Inference*. Thousand Oaks, California: Sage.

\*P.D. Allison. 2002. *Missing Data*. Thousand Oaks, California: Sage.

\*Multiple Imputation Using ICE. UCLA: Academic Technology Services, Statistical Consulting Group <http://www.ats.ucla.edu/stat/stata/library/ice.htm> (accessed January 14, 2008).

\*V. Kang Fu, C. Winship, and R.D. Mare. 2004. "Sample Selection Bias Models." Pp. 409-430 in M. Hardy and A. Bryman (eds.) *Handbook of Data Analysis*. Thousand Oaks, California: Sage.