

# Structural Equation Modeling

**By Alex Liu**

**Course Description:** This course introduces to students the basic concepts, methods and computing tools of structural equation modeling. Emphasis will be placed on developing a working familiarity with some of the common statistical procedures, coupled with their application through the use of statistical software. It is a seminar course for the Ph.D. Candidates in The Paul Merage School of Business and in Social Science Departments of the [University of California at Irvine](#). This page is the starting point for information about this course in the Fall Quarter of 2005. If you have any comments, questions, or suggestions, please feel free to [contact the instructor](#).

## **Course Reading Materials:**

### **1) Basic Readings:**

Rex B. Kline 2005 Principles and Practise of Structural Equation Modeling, Guilford Press

E. Kevin Kelloway 1998 Using LISREL for Structural Equation Modeling, Sage Publications

Otis Dudley Duncan 1975 Introduction to Structural Equation Models, New York: Academic Press

Ken Bollen 1989 Structural Equations with Latent Variables, Wiley

Gerhard Mels 2003 Getting Started with the Student Edition of LISREL 8.53 for Windows, Scientific Software International

[LISREL / PRELIS Examples](#)

### **2) Using SEM for Causal Analysis:**

Judea Pearl 2000 Causality: Models, Reasoning, and Inference, Cambridge University Press

Bill Shipley 2002 Cause and Correlation in Biology, Cambridge University Press

## **Lecture Outline:**

## ***Section I - Theory***

Week 1: Course Introduction and Statistics Review

*Reading: Kline Chapter 1 ~ 3*

Week 2: Path Analysis

*Reading Kline Chapter 4.1~2, 5.1 ~ 5.7, 6.1 ~ 6.5*

Week 3: Confirmative Factor Analysis and Hybrid Models

*Reading: Kline Chapter 7 ~ 8*

## ***Section II: Practice and Software***

Week 4: Model Specification

*Reading: Kline Chapter 5.2 7.1 9.1, Kelloway Chapter 2*

Week 5: Model Estimation

*Reading: Kelloway Chapter 1~2, Kline 5.6~5.7, 6.7, 8.3, 9.3*

Week 6: LISREL and Computing

*Reading: Kelloway Chapter 3~4 and LISREL How-to (Getting Started with LISREL)*

## ***Section III: Application and Your Research***

Week 7: LISREL Results and Model Modification

*Reading: Kelloway Chapter 5~7*

Week 8: Model Diagnostics & Model Validation

*Reading: Kelloway Chapter 2~3 Kline Chapter 12 and research articles*

Week 9: LISREL Work and Research (Causal Analysis)

*Reading: Kline Chapter 9~12*

Week 10: Presentation and Critique

## **Homework Assignment:**

**Assignment One** - Research Proposal (due in the third week) - the proposal shall include

Introduction

Argument

your theory, causal models represented in words

Variables/Dataset

**Assignment Two** - Initial Model Specification (due in the fifth week) - Modify your hypotheses, specify a few SEM models, check their identification issues and prepare your data (check missing values, normality, linearity, multi-collinearity and outliers, and use variable transformation to correct if problems identified)

**Assignment Three** - Model Estimation (due in the seventh week) - use LISREL to estimate your specified models and present your results in forms of equations AND diagrams.

**Assignment Four** - Model Modification and Final Model (due in the ninth week) - study fit indices from your estimation results, modify your model for re-estimation. Get your final model and summarize the results.

**Final presentation** - Use Microsoft PowerPoint Slides to present your research in the tenth week.

Assignments may be modified to best fit students' progress. Please check the lecture notes for updates.

### **Grades**

The course grade will be determined using the following distribution:

	Percentage
Problems Sets	60%
Seminar Participation	15%
Final Presentation	25%

### **Software**

We will use LISREL. Each student should download the student edition of LISREL 8.7 for Windows. [CLICK here to download](#) or go to <http://www.ssicentral.com/other/entry.htm>.

Lecture Notes are available in <http://www.researchmethods.org/sem-notes.htm>