

## Introduction to Structural Equation Models

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This course is an introduction to structural equation models as applied to problems in the social sciences, broadly defined. The major purpose of the course is to familiarize you with the technique of structural equation modeling and to provide you with working knowledge of AMOS, a computer program designed for the analysis of a broad class of structural equation models.

### **Textbook**

We will not have a formal textbook, however I recommend the book below by Tim Brown. Although I will not assign formal readings from this book, I will identify chapters that correspond to material being covered in class, and I will comment on the various chapters of the textbook during lecture. The book is

Brown, T. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford.

I will discuss other books you can use as resources for SEM analyses throughout the class.

### **Class Materials**

There are extensive class handouts that you can download from the course website as pdf files. Bring all handouts to every class, i.e., print them out, put them in a binder and bring them to class. I refer to the handouts every class. If you do not bring them, you will get lost during the lectures.

We will learn to conduct SEM analyses using the computer program called AMOS, which is available through SPSS. The program costs about \$600 US as a standalone. You can download a full trial copy of SPSS (that includes AMOS) from the SPSS website ([www.spss.com](http://www.spss.com)) and it will work for two weeks, which spans the length of this class.

Another option is to purchase the SPSS graduate pack. This includes a full version of SPSS as well as AMOS and the license is good for four years. It costs about \$200 US. If you “google” the keywords “spss graduate pack” or check the spss website (<http://www.spss.com/gradpack/>), you will find numerous sources for purchasing the graduate pack.

Another option is to “rent” the SPSS Graduate Pack for six months at a cost of \$46 or 12 months for \$90. You can rent it at <http://www.e-academy.com/>

### **Course Requirements**

The main requirement is homework assignments. You will be given data sets to analyze using

the AMOS computer program. I will give you five assignments. You will be given informal in-class quizzes on the output from your analyses.

## **Statistical Background**

I assume you have good working knowledge of simple bivariate regression and knowledge of the basics of multiple regression.

## **General Course Outline**

*Session 1: Review and introduction:* This will be a review session to make sure we all have common knowledge of theory, measurement, and statistics as we embark on SEM analyses. Topics covered include classic test theory, matrix algebra, summation notation, standard scores, correlation and regression, causal modeling, path diagrams, expressing path diagrams as linear equations.

*Session 2: The basics of SEM:* Topics will include decomposition of correlations, identification status of models, global measures of model fit, focused measures of model fit, effects analysis, introduction to AMOS and a detailed example, modification indices, standardized residuals. Assignment 1 will be given.

*Session 3. Latent variable models.* Topics will include a review of assignment 1, latent variables, confirmatory factor analysis, nested models, correlated error in SEM, choice of indicators, revisiting test theory. Assignment 2 will be given.

*Session 4. Miscellaneous issues.* Topics will include sample size considerations, outliers, non-normality, limited information estimation approaches, and model modification. Assignment 3 will be given.

*Session 5: Categorical variables in SEM:* Topics will include a review of assignment 3, use of dummy variables, logistic and probit regression as a special case of SEM, introduction to M Plus. Assignment 4 will be given.

*Session 6: Multiple group solutions* Topics will include a review of assignment 5, multiple group modeling, and issues of metric invariance. Assignment 5 will be given.

*Session 7: Review and applications.* Topics covered will include a review of assignment 5, non-linear models, and analysis of reciprocal causality.