1. Course Statement

This course will build on students’ previous knowledge of multiple linear regression, expanding the framework to allow for simultaneous estimation of multiple equations and to deal with casually related observed and latent variables in complex causal models. It provides the basic theoretical background necessary for the application of Structural Equation Modeling (SEM) to research problems including model specification, identification, path analysis, estimation, testing fit, re-specification, confirmatory factor analysis and issues concerning the interpretation of SEM results. Advanced topics will be discussed if time permits. The software package Mplus will be the primary analysis tool for this course. Focus of this course will be on applying SEM to real world research. Understanding of linear regression is assumed for this course.
a. Course content
This course is an introduction to structural equation modeling (SEM) as applied to problems in the social sciences, broadly defined, and social work. The major purpose of the course is to familiarize you with the technique of structural equation modeling, the strengths and weaknesses of the approach, and to provide you with working knowledge of Mplus, a computer program designed to execute the analysis of a broad class of structural equation models.

2. Class Requirements

a. Statistical background
I assume you have good working knowledge of simple bivariate regression, preferably working knowledge of multiple regression, and knowledge of the traditional paradigm of null hypothesis testing (e.g., p values, confidence intervals). Usually, the statistical background of students in my class is highly variable. I try to keep things simple, practical, and to be respectful of those who do not want a slew of formulae and matrix algebra. I make sure you have an appreciation of the underlying mathematics and of the complexities of SEM, but I will not overload you with formulae. Having said that, I also want to accommodate more advanced students, so I usually take time in each class to discuss selected matters at a higher level. Such discussions will not impact your ability to do the homework or to appreciate at a conceptual and methodological level the underlying issues. This not a difficult class, but you will need to bring your thinking caps!

b. Text and class materials
I will post on the course web page articles in pdf form that we will consult or that elaborate on issues discussed in class. These are primarily for reference and for you to consult on an as needed basis. Because I will rely primarily on these on-line materials, we will not have a formal textbook for the class. However, I will discuss in class current textbooks that are available and that I recommend.

There are extensive class handouts that you can download from the course website. I will tell you before each class session which handouts to bring and also will post an announcement on our class web page about what handouts to bring. Be sure to print them out and bring them to class. I cannot stress how important this is. I refer to handouts in almost every class. If you do not bring them, you will get lost during the lectures/discussion. I will also make available to you the PowerPoints on which my
lectures are based. I will post a given PowerPoint on the website for you to download and print out for note taking the night before the class in which I will use the PowerPoint.

We will learn to conduct SEM analyses using the computer program Mplus. It is available at the website https://www.statmodel.com/. There is a free demo version that can be downloaded at https://www.statmodel.com/demo.shtml. It is restricted in terms of the number of variables it will accommodate and is quite limited, but you can get by with it for the class, if necessary.

There is a student version of Mplus that can be purchased at a rate that is considerably discounted. It can be ordered at the link


The student pricing entitles you to use the program as long as you are a student, for up to four years. There are three versions, (1) a base version for $195, (2) a base plus mixture modeling version for $240, and (3) a “full” version that also includes multi-level modeling for $350. I strongly recommend you purchase the full version of the three, but if it is too much, I recommend the one with mixture modeling.

Mplus is available on computers at the university. I will announce where these are located on the first day of class and you can use these if you want. We will not need access to Mplus in class.

For non-students in the class who are faculty, we will arrange for you to have access to the course materials and discuss ways of acquiring Mplus through the university.

c. Class schedule

I will be using a wide range of examples throughout the class, including the analysis of RCTs, longitudinal data, mediation, moderation, and traditional correlational data.

Topic 1: Review of regression and mathematical concepts needed for later lectures.

Topic 2: Constructing causal theories: How to generate ideas and build theories that are amenable to structural equation modeling. Creative theory construction.

Topic 3: The basic logic of SEM as a strategy for evaluating causal models in terms of covariance/correlation decomposition. Introduction to evaluating model fit.
Topic 4: Single indicator causal modeling and an introduction to Mplus. Identifying mediated relationships, analyzing total effects in models, and dealing with correlated error. Translating traditional statistical tests into SEM frameworks.

Topic 5: Theory revision in the face of poor model fit

Topic 6: Latent variable modeling and confirmatory factor analysis.

Topic 7: Addressing measurement error in single indicator models.

Topic 8: Latent variable regression and complex causal models.

Topic 9: Advanced topic 1 (to be determined by the class; e.g., multiple group analysis, interaction analysis, mixture modeling, categorical outcomes, multi-level SEM; higher order factor analysis; exploratory SEM)

Topic 10: Advanced topic 2 (to be determined by the class)

Topic 11: Missing data, non-normality, outliers, and measurement assumptions. How to write a thesis proposal that uses SEM

d. Assignments

The main requirement is satisfactory completion of homework assignments. You will be given data sets to analyze using SEM. I will give you five such assignments. You will be given informal in-class quizzes on the output from your analyses.

You must come to class. If you miss a class, it will be very hard to not lose your bearings, because so much of the knowledge is cumulative. Think of it like taking a class to learn a foreign language and you miss the class on verbs. Not good.

Additional School and University policies, information and resources are available here: https://ssw.umich.edu/standard-policies-information-resources. They include:

- Safety and emergency preparedness
- Mental health and well-being
- Teaching evaluations
- Proper use of names and pronouns
- Accommodations for students with disabilities
- Religious/spiritual observances
- Military deployment
- Writing skills and expectations
- Academic integrity and plagiarism