EDUC 737 (001) & PSYCH 958 (004): Structural Equation Modeling
Winter 2015 Syllabus

Course location: 4212 SEB
Course time: Wednesday, 4-7pm
Matthew A. Diemer, Ph.D
OFFICE: 4120 SEB
diemerm@umich.edu [best way to contact me]
Phone: 734-647-7369

Course Overview
This course is designed to provide students with conceptual understanding of structural equation modeling (SEM) and guided experience running these analyses using a powerful software package, MPlus. The emphasis in this course is more applied than technical. [Students interested in more technical aspects of and/or advanced extensions of SEM are encouraged to talk with the instructor and/or request suggestions for further study.]

At the end of this course, students will have the conceptual and analytic skills to specify, analyze, and interpret SEMs. However, no single course can provide students with everything they would need to know to handle the inevitable complexities that arise during analyses (including but not limited to SEM analyses). A second goal of the course is for students to have sufficient conceptual, technical, and syntactic understanding of SEM to solve the methodological problems that will come up in your future work by consulting the methodological literature, seeking training, and/or consulting.

Course Format
Every class meeting will be (roughly) split into two parts. In the first 60-75 minutes, we will go over conceptual issues. In the second 60-75 minutes, we will apply these concepts by conducting analyses with MPlus. Data sets will be provided to students in advance.

Required text:

In many weeks, we will also read an “empirical example” that illustrates the analytic approach being covered that week.

Software Requirement
All students will be required to download the free demo version of the MPlus software program. The MPlus demo can be downloaded here. MPlus has become the dominant SEM software package and allows the user to conduct a dizzying variety of analyses – but the good news is that it has a fairly intuitive and simple syntax. The MPlus demo version has no limitations on the kinds of analysis you can do, but allows no more than six dependent variables and two independent variables. As a reference, you need also to download the Mplus users guide from the MPlus website: statmodel.com

Students who need the full version of MPlus (which has no restrictions on the number of variables) have two options. Option #1: Students interested in purchasing the full version of MPlus are free to do so and can also use the full version for this course. You may purchase the
student version of MPlus for $195 via statmodel.com. **Option #2:** Students can access the full version of MPlus via the University of Michigan’s ‘Virtual Sites’ portal. The Virtual Sites portal will allow up to four users (on a first come, first served basis) of MPlus from the UM campus at any one time, and can be accessed via: http://virtualsites.umich.edu

Some data preparation and descriptive analysis using SPSS may also be required.

**Course Requirements**

- **Class Attendance.** Students should attend every class, except in cases of illness and/or extenuating circumstances.

- **Accommodations for Students with Disabilities.** If you need an accommodation for a disability, please speak with me at your earliest convenience. Some aspects of this course may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work together with the Office of Services for Students with Disabilities (SSD) to help us determine appropriate academic accommodations. SSD (734-763-3000; www.ssd.umich.edu) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. Any information that you provide is private and confidential and will be treated as such.

- **Students’ Rights and Responsibilities.** Membership in the academic community that is the University of Michigan affords you a number of important rights, as well as a number of important responsibilities. Please see http://www.oscr.umich.edu/statement/ for information about these rights and responsibilities.

**Course Assignments and Grading**

For all written course assignments, standard APA formatting applies (double-spaced, 12 point font, 1 inch margins on all side, single-sided pages. This excludes title page, references, and brief appendices – although an appendix cannot be used to get around page limits).

Assignments and grading will be as follows, totaling 120 possible course points:

- **Class Attendance and Participation** (40 course points): This is a graduate seminar emphasizing critical discussion of course concepts and readings. Active, relevant, and regular participation in class discussions, small group activities, and other in-class exercises is the most important requirement of the class and a vital way for you to actively learn this material. Students should come prepared & attend every class, except in cases of illness and/or extenuating circumstances (please contact me in these instances).

- **Commentaries** (25 course points): Every week that there are assigned readings (beginning in week two), you will write a brief (2-3 paragraph) commentary on the readings. These commentaries can range from specific methodological questions to integration of concepts across weeks to specific analytic issues. Be sure that you say enough about each reading to demonstrate that you have read them all, but **please do not summarize the readings.** Your goal in this assignment is to say something insightful or novel, while assuming your reader (the instructor) has already read the articles and understands them quite well. A quick way to
remember the ‘core’ of this assignment is to focus on comments, questions, critiques, connections, and concerns raised by the readings. You can “maximize the payoff” of the commentaries if you include one (or more) questions you have about what you’ve read for that week – something you found confusing or particularly interesting – that you can raise during our class meeting for further discussion.

Post your commentary on CTools no later than 3pm (EST) the day before class meets. Reading your classmates’ comments is strongly encouraged. Responding to their comments is not required, but always welcome, and will help you be better-prepared for our in-class discussion the following day. Late submissions will be penalized heavily.

- **Article Critique** (25 course points): A 3-5 page paper will critique one published empirical journal article that uses SEM. The article should align with your substantive area of interest, and must use SEM or some variation (e.g., CFA, MIMIC models, instrument validation using CFA, path analysis) as its primary analytic approach. You should select a paper that applies SEM to some substantive issue that is of interest to you, rather than a purely technical paper regarding SEM. If you’d prefer to review and critique a more technical paper (for example something published in the Structural Equation Modeling journal) you are required to consult with the instructor first. **You may not critique one of the ‘empirical examples’ that are required readings for this class.**

Your critique should resemble how peer-reviewed articles are critiqued in that the critique should begin with a brief summary of the paper’s intent, methods, major findings, and implications. Your critique should focus on (including but not limited to the following): the analyses carried out by the researchers, the strengths and weaknesses of their analytic approach, considering whether a different analytic approach would’ve been better or provided different answers, and whether the inferences drawn from the analyses are appropriate. In writing your critique, keep in mind that it is easy for you to establish that you’ve read the paper in a few sentences – so instead devote your (precious) page space toward evaluating the analysis of the paper. It’s an obvious point – but be certain to select a paper with an analytic approach that you can understand and offer comment on.

The critique of empirical research paper will be due on April 8th by 5pm EST. A dropbox will be enabled on for submission of the critique papers. When submitting your Critique paper, you are required to also submit a copy of the article being critiqued (in .pdf or other format).

- **Homework** (30 course points): At three points during the semester, each student will complete data analyses (outside of class) as ‘homework.’ A dataset will be provided to you. In these assignments, you will be required to develop the Mplus code required to carry out the assigned analysis, interpret the output, and complete a brief write-up of your analyses. More information about each of the three homework assignments will be provided.
## Course Schedule & Topics

1. **Introduction: Why Use SEM & Understanding SEM via Pictures**
   - January 7

2. **Preparing Datasets, Modeling & Evaluating Model Fit**
   - January 14

3. **Hands-on SEM: The Building Blocks of MPlus Syntax**
   - January 21

4. **Using Boxes to Measure Circles: Confirmatory Factor Analyses (CFA)**
   - January 28

5. **Mediating Chains With Observed Variables: Path Analysis**
   - February 4

6. **Identification & Estimation Issues in SEM**
   - February 11
   - ---Homework Assignment #1 due---

7. **Mediating Chains with Latent Variables: Structural Equation Models**
   - February 18

8. **Moderation, Part I: MIMIC Models**
   - February 25
   - --- Homework Assignment # 2 due---

9. **SPRING BREAK WEEK**
   - March 4

10. **Moderation, Part II: Measure Invariance & Multi-Group Models**
    - March 11

11. **SRCD meeting, NO CLASS TODAY**
    - March 18
    - --- Homework Assignment # 3 due---

12. **Covariates & Statistical Control in SEM**
    - March 25

    - April 1

14. **Missing Data**
    - --- Empirical Critique Due ---

15. **Workshop & & Advanced Extensions**
    - April 15
Course Schedule & Readings
[Listed by suggested order of reading, for each week]
[All articles provided, many with instructor annotation, in CTools]

1. Introduction: Why use SEM & understanding SEM with pictures  January 7
   Kline, CHs 1 & 2

2. Preparing Datasets & Evaluating Model Fit  January 14
   Kline, CHs 3 & 8 (note skip p. 210-229)

3. Hands-on SEM: Programming with MPlus  January 21
   Kline, CH 4
   Odum Institute Handout [posted to CTools]

4. Using Boxes to Measure Circles: Confirmatory Factor Analyses (CFA)  January 28
   Kline, p. 112-117 & CH 9
   Byrne (2012) chapter – [posted to CTools]

5. Mediating Chains With Observed Variables: Path Analysis  February 4
   Kline, p. 103-112 & CH 6

6. Identification & Estimation in SEM  February 11
   Kline, CH 5 (p. 91-106), CHs 6 & 7

7. Mediating Chains with Latent Variables: Structural Equation Models  February 18
   Kline, p. 118-121 & CH 10

**8. Examining Moderation, Part I: MIMIC Models**  
February 25

Kline, p. 247-248; 282-283 & p. 322-325


**9. SPRING BREAK WEEK**  
March 4

**10. Examining Moderation, Part II: Multi-Group Models & MI**  
March 11

Kline, p. 251-261


**11. SRCD meeting, class cancelled**  
March 18

**12. Covariates & Statistical Control in SEM**  
March 25


April 1

Kline, CH 13


14. **Missing Data & Advanced Extensions**  
   *April 8*  
   Kline, p. 55-59


15. **Workshop & Advanced Extensions**  
   *April 15*  


View on youtube: [Endogeneity: An inconvenient truth](#)