Course Syllabus: Topics in Advanced Structural Equation Modeling
(PSYC 6761)
Fall 2015, T 2–4:30 PM
DUAN G116

Instructor
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Office Hours: M 3-4 in Muen D438 and by appt (Muen D438 or IBG 203)

Course Description
This course will provide exposure to topics in structural equation modeling (SEM) that go beyond what is typically taught in an introductory SEM class. Emphasis is placed on those techniques that will be encountered most often in the literature and those that will prepare you to answer a wide variety of research questions. Topics will include latent variable growth models (nonlinear trajectories, piecewise, parallel process, etc.), latent difference scores, models with categorical latent variables (latent class and profile analysis, growth mixture models, etc.), and latent variable interactions. Other topics will be covered in student presentations (see below). My goal is to prepare you to use these techniques in your own publications and to critically evaluate their use in others' work.

Prerequisites
Sequence in introductory graduate statistics for psychology (or equivalent). Introduction to SEM (e.g., PSYC 5761 or EDUC 7396), or permission from me.

Text
There is no required text. Below, I have some recommended references; we will read selected chapters from these books, but the entire texts are useful.

Recommended:


Software
All examples and class assignments will use Mplus.

Expectations and Assignments
You will be expected to attend all classes having read the assigned material. Readings will be available on D2L. Lectures will focus on emphasizing points or adding to them, providing examples, and discussing questions you have.

I believe that hands-on application is the best way to learn SEM, so most classes will include interaction with Mplus in the form of exercise sets. These exercises are a major part of the class; I have designed them to guide you through basic analyses but also to get you thinking about relevant issues (e.g., how to evaluate certain hypotheses, why models might not fit, what models might be equivalent/similar, etc.). The grading on these will be pass-fail; the important thing is that you do them!

Final project:
There are 2 options for your final project:

Option #1:
This is a "topics" class. I have selected some topics that I consider to be important ones you will likely encounter in the literature, but there are many more. Often, you'll have to teach yourself a topic; I want to help you develop that very important skill, so you feel you know where to start. At the same time, I want us all to be exposed to more topics. Therefore, one option for your term project is to focus on a topic of your choice. The best way to learn a topic is to use it and explain it to others, so as your final project, you will prepare a mini-lecture on a topic that lasts approximately 30 minutes (extra time will be allowed for questions). This is not intended to be comprehensive, but to give you and the other students a brief introduction to the topic you choose. You may select a topic not covered in the first part of the class (see some ideas below), or you could choose to expand on or integrate multiple topics already covered (for example, estimating a model we have covered in a different program, like OpenMx). I will work with you on selecting a topic and recommending some reading to get you started. You will also prepare an exercise set to accompany your mini-lecture.

Your mini-lecture should
1. Explain what kinds of questions/issues the technique can be used to address
2. Contextualize the topic in terms of concepts already learned
3. Be introductory and understandable: don't try to cover too much
4. Be accurate
5. Include at least one recommended reading (usually an overview)
6. If appropriate, include an example analysis

Your exercise set should
1. If appropriate, include a dataset (real or simulated)
2. Guide the user through a basic analysis on that topic, using an annotated script
3. Have 2 versions: one with suggested answers, and one that is blank. Both will be available to the class (working on your exercises will be strictly optional for the other students, not a class assignment)

**Potential topics:**
- Parcelling
- Piecewise model for experimental data
- Analyzing skewed data
- Analyzing count data
- Plausible values (multiple imputation)
- Exploratory SEM
- Confirmatory latent class analysis
- Latent transition analysis
- Two-part growth models
- Time-varying covariates in growth models
- Item response theory models
- Expand on or integrate multiple topics already covered

**Option#2:**
If you have a dataset that you want to analyze using a technique covered in class and prefer to do that for your final project, you can do so. **At the end of the semester you will give a 30-minute presentation of your project to the class, and turn in a written report** (APA-style "Method" and "Results and Discussion" that includes both the statistical findings and some interpretations).

**Your presentation should**
1. Provide enough background and method so we understand the questions and hypotheses
2. Explain which analysis technique(s) you use to address these questions and why
3. Present details of the analysis
4. Reflect a correct usage of the analysis technique
5. Discuss the results, with a focus on how the statistics led you to conclusions
6. Can include a discussion of problems to address/alternative analyses you could do

**Your written report should**
1. Include a very brief intro to explain the study and questions, and how you will address them
2. Include a brief methods section that focuses on details needed to understand the analysis
3. Include a "statistical analysis" section to explain the analysis technique you will use. This should have pertinent details such as fit criteria, model comparisons, transformations, etc.
4. Include a "Results and Discussion" section that focuses on the statistical results and how they answer your questions (include a figure and/or table for primary results)
5. Include the basic descriptive information for your data
6. Include your model syntax and output in an appendix

**Timeline for Final Project:**

*By 10/19:* Send me your top 2-3 choices (ranked) for your topics (option #1) or a short abstract on your project plan (option #2). I will assign topics in the order I receive them and let you know what topic you'll be doing in class on 10/20 (as well as what day you've been assigned; see below). If you'd like to talk to me about the options or run something by me, please come to my office hours or set up a time to do that before this date.

*By 10/26:* Option #1: Send me your proposed reading for your topic. I will post it on D2L so that others can take a look at it before your mini-lecture if they want.

*11/17 & 12/8:* Presentation dates (before and after Fall break). I will assign a day to you and let you know on 10/20 what it will be.

*The day before your talk:* Turn in your exercises (option #1) or written report (option #2) to me. I'll make exercises available to others on D2L.

**Grading**

- 20% – Class participation
- 40% – Homework assignments (pass/fail)
- 20% – Final project presentation
- 20% – Final project written (report or exercises)
# Tentative Course Schedule
*(subject to change; check D2L)*

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<th>Week 1 (8/25)</th>
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<tr>
<td>Introduction: review and overview</td>
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**Readings:**

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<th>Week 2 (9/1)</th>
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<td>Review of linear latent growth curve models; conditional models</td>
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**Readings:**
- Bollen & Curran (2006), chapter 2 & chapter 5 (pp. 139–161)

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<th>Week 3 (9/8)</th>
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<td>Latent growth curve models: nonlinear growth</td>
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**Readings:**
- Bollen & Curran (2006), chapter 4

**Optional:**

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<th>Week 4 (9/15): Guest Lecture (I will be away at the ESCoP conference)</th>
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<td>Guest lecture (Soo Rhee &amp; Mike Stallings): biometric genetic models</td>
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**Readings:**

**Optional:**
### Week 5 (9/22)
Latent growth curve models: nonlinear growth continued

**Readings:**

### Week 6 (9/29)
Latent growth curve models: multivariate & comparison with panel models

**Readings:**
- Little (2013), chapter 6

### Week 7 (10/6)
Latent difference scores

**Readings:**

**Optional:**

### Week 8 (10/13)
Mixture models: categorical latent variables

**Readings:**

Optional:

***By 10/19: send me your top 2-3 topics/abstract for your final project.***

**Week 9 (10/20)**
Mixture models continued

Readings:


Optional:


***By 10/26: send me your proposed reading for your topic in pdf form.***

**Week 10 (10/27)**
Relating class membership to variables not in the model
And simulating data (useful for constructing your exercises)

Readings:

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**Week 11 (11/3)**
Latent variable interactions

**Readings:**

**Week 12 (11/10)**
Latent variable interactions continued

**Readings:**

Mplus FAQs on standardization and plots.

**Week 13 (11/17)**
**Assorted topics: Student presentations**
Turn in your exercises/written project the day before.

**Fall Break (11/24)**

**Week 14 (12/1)**
Class cancelled: I will be at an NIH workshop

**Week 15 (12/8)**
**Assorted topics: Student presentations**
Turn in your exercises/written project the day before.
General Policies

Disability
If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Injuries guidelines [http://disabilityservices.colorado.edu/quick-links/temporary-injuries] under the Quick Links at the Disability Services website [http://disabilityservices.colorado.edu/] and discuss your needs with your professor.

Religious Observances
Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. If you anticipate any conflicts with the course requirements described in the syllabus due to religious observances, please bring those to my attention now so that alternative arrangements can be made. See full details at http://www.colorado.edu/policies/observance-religious-holidays-and-absences-classes-and-or-exams

Honor Code
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Classroom Behavior Policy
Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran’s status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior [http://www.colorado.edu/policies/student-classroom-and-course-related-behavior] and the student code [www.alumniconnections.com/links/link.cgi?l=6681993&h=131157&e=UCBI-20150813152414].
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