Psychology 674
Structural Equation Modeling
Spring 2020
Tuesday/Thursday, 10:30-11:45 am
PSYC 3187
January 13-May 2, 2020

INSTRUCTOR: Susan South, Ph.D.
OFFICE: PSYC, Room 1246
OFFICE HOURS: By appointment
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TA: Madison Smith
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OFFICE HOURS: Thursdays 12:00-1:00 pm

COURSE OVERVIEW AND OBJECTIVES: This is an advanced course in structural equation modeling (SEM), intended to provide doctoral students with an introductory treatment of the theory and methods of SEM. SEM is a statistical methodology that encompasses a wide variety of models, including path models, exploratory and confirmatory factor models, structural regression models, and latent growth models, among others. We will focus on path, factor, and structural regression models, as these will be most widely applicable to the students in the class. We will touch on special issues and more advanced models, but students are also recommended to pursue additional classes that specifically touch on these types of models (e.g., latent growth models). SEM has been used in a wide variety of disciplines, including economics, marketing, medicine, biology, etc. In this class, we will focus on using SEM within the social and behavioral sciences, and many of the examples presented in class will specifically come from psychological science. The instructor will primarily use the Mplus and SPSS software, although some examples may be presented in AMOS and SAS. Students are assumed to have taken at least two graduate statistics courses and have a solid understanding of linear modeling. A course in multivariate statistics, taken prior to or commensurate with this course, is highly recommended. By the end of the course:

1. Students should obtain a basic-to-intermediate understanding of the logic of SEM and grasp the underpinning statistics of SEM.
2. Students should take away the ability to critically read and evaluate empirical journal articles that use SEM.
3. Learn and apply strategies for specifying, estimating, and interpreting path analysis and latent factor models.
4. Students should acquire programming skills for conducting SEM.

COURSE FORMAT: This course will meet twice a week on Tuesday and Thursday. During the Tuesday class and the first half of the Thursday class, I will present an

overview of the theory and method for the topic of the week. Then, the TA and I will lead a lab section for the second half of the Thursday class. During this lab section, students will work through practical examples and the weekly homework. There may be some deviations from this format throughout the semester, but in general students should come prepared with a laptop and data to be analyzed on Thursday. Students should come to every class having done the reading for the week.

READINGS:

You ***should*** purchase the following books:

> Brown,T.A. (2015). Confirmatory factor analysis for applied research (2nd edition). New York: Guilford.
>
> Kline, R.B. (2016). Principles and practice of structural equation modeling (4th edition). New York: Guilford.

Other required readings are noted on the course schedule and are available on the course website.

COURSE WEBSITE:
The syllabus, class notes, and any announcements will be posted on the Blackboard™ webpage for the class. Blackboard's website is https://mycourses.purdue.edu/ and your email password should work for your login.

EVALUATION:
Your grade in the course will be determined by three factors: attendance, weekly assignments, and a final project.

1) Attendance
Attendance at all class meetings is required. If you will not be there, please send me an e-mail note to explain your absence. I expect you to be *on time* to class. You must also meet with me outside of class (at least once) prior to Spring Break to discuss your final project for the course. Please email me to set up an appointment.

2) Weekly homeworks
You will have homework almost every week. Each week, I will distribute a homework assignment on Tuesday that will be due at the beginning of class the next week (i.e., due 1 week later at the next Tuesday class at the beginning of class). We will go over the correct answers for the homeworks during the subsequent lab (i.e., Thursday after the Tuesday that the homework is due). Given this tight schedule, no late homeworks will be accepted without advance permission of the instructor. All homeworks will be graded on the following scale:

0=No homework provided or completely failed to grasp the point of the assignment
1=Homework was only partially completed or the work was substandard
2=Adequate response, homework was fully completed but there were obvious errors
3=Fully and correctly completed

3) Final Project

Students will complete a final term paper based on a topic of your choice. The goal is to complete an empirical paper (using original or secondary data) that incorporates a thorough literature review, method section, statistical analysis using a method covered in class, and discussion. The final project should be a complete manuscript that is ready to be submitted for publication. Feel free to choose a topic that is relevant to your own research. It will be important for you to read the original sources so that you can evaluate the research methodology in defining your hypothesis. (Hopefully students will have their own data to analyze, but if they are in need of data, they should see the instructor).

Prior to submission of the paper, all topics must be approved. Please submit a proposal outlining the topic, the basic structure of the paper, and noting why this topic is significant to the field (the proposal will be approximately 1-2 pages). ***This proposal is due on March 24 by class time.*** You should upload the proposal to Blackboard. ***Please bring 4 copies of your proposal to class on March 24 for a round-robin review.***

The final paper will be graded based on the appropriateness of the statistical method and the quality of the analysis. Papers should not exceed 20 pages in length, excluding references. ***The final paper is due on May 4 by 5pm. You should upload the final paper to Blackboard.***

You will each conduct an in-class presentation based on the topic covered in your paper. This presentation will be 10 minutes in length followed by a few minutes for questions. The presentation will be graded based on organization, clarity, and quality of analysis. You will be expected to prepare a handout for the class (a copy of the power point slides will work best), ***which must be emailed to the instructor by April 21 at 8am.*** Order of in-class presentations will be determined by lottery.

Your final grade in the course will be calculated along the following lines:

- Attendance (10%)
- Weekly homeworks (40%)
- Project Proposal (5%)
- Final Presentation (10%)
- Final Paper (35%)

Final grades will be determined as follows:

100	A+	87-89.9	B+	77-79.9	C+	67-69.9	D+
93-99.5	A	83-86.9	B	73-76.9	C	60-66.9	D
90-92.9	A-	80-82.9	B-	70-72.9	C-	<60	F

Course Policies:

Course Changes: In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or

other circumstances beyond my control. Any changes to the course will be posted on Blackboard, sent via email, and announced in class.

Missed Classes/Assignments/Presentation: For planned absences (e.g., University-sponsored activities, religious observances, conference travel), arrangements must be negotiated with me in advance. In the event of the death of a family member, you are protected by the Grief Absence Policy for Students. For more information, see: www.purdue.edu/odos/services/griefabsencepolicyforstudents.php

Special Needs: I want to enable everyone to participate fully in the course. If you have a physical, psychological, medical, or learning disability that may impact your course work, please make an appointment to speak with me in order to discuss any adjustments. In addition, it is your responsibility to notify the Disability Resource Center of any impairment/condition that may require accommodations: www.purdue.edu/drc

Academic Integrity: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty (e.g., plagiarism or behavior consistent with cheating) will be reported to the Office of the Dean of Students. The first instance will result in a grade of zero on that exam/assignment, and the second instance will result in an F for the course. For more information on academic integrity, including categories of academic dishonesty, please refer to Purdue's student guide for academic integrity: www.purdue.edu/odos/aboutodos/academicintegrity.php

Behavior: Purdue University is committed to providing a safe and secure campus environment for members of the university community that promotes learning. Violent behavior is prohibited while participating in any university activity. Faculty are required to report to the Office of Student Rights and Responsibilities any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

Discrimination is prohibited against any member of the University community on the basis of race, religion, color, sex, age, national origin, genetic information, marital status, parental status, sexual orientation, gender identify and expression, disability, or status as a veteran. If you believe you have been discriminated against, you may submit an anonymous complaint to the Office of Institutional Equity: www.purdue.edu/report-hate

SCHEDULE AND COURSE OUTLINE

Week	Date	Topic	Reading	Assignment
1	1/14, 1/16	Introduction, Goals, Overview	Kline, Chapters 1 & 2	
2	1/21	**NO CLASS**		
	1/23	SEM Basics: Background, Terminology, Models	Kline, Chapters 3 & 4	
3	1/28	SEM Basics: Background, Terminology, Models (cont)		Homework 1 (**due 2/4**): SEM software assignment
	1/30	Intro to Software	Kline Chapter 5	
4	2/4	Specification, Identification, Estimation	Kline, Chapters 6, 7, 11	Homework 2 (**due 2/11**): Identify data set and preliminary question
	2/6	Specification, Identification, Estimation (cont) Review Homework 1		
5	2/11	Path Analysis: Specification and Identification	Thoemmes (2015)	Homework 3 (**due 2/18**): Specifying a Path Model
	2/13	Path Analysis: Estimation and Model Fit	Kline Chapter 12	

6		2/18		**NO CLASS**			
		2/20		Path Analysis: Extensions Review Homework 3			Homework 4 (**due 2/25**): Running a Path Model
7		2/25		Factor Analysis: Conducting Exploratory Factor Analysis, Specification and Identification of Confirmatory Factor Analysis		Brown Chapters 1, 2, 3, 4 Kline Chapter 9 Supplemental: Chapter 1 in Tucker & MacCallum (1997), *Exploratory Factor Analysis* http://www.unc.edu/~rcm/book/factornew.htm	Homework 5 (**due 3/3**): Specifying a CFA Model
		2/27		Confirmatory Factor Analysis: Specification (cont) Review Homework 4			
8		3/3		Confirmatory Factor Analysis: Programming and Estimation		Brown Chapter 5 Kline Chapter 13 Jackson, Gillaspy, & Purc-Stephenson (2009)	Homework 6 (**due 3/10**): Running a CFA Model
		3/5		Confirmatory Factor Analysis: Programming and Estimation Review Homework 5			

9		3/10		Special issues: MTMM, Multiple group models, higher-order & bi-factor models		Kline Chapter 16 Brown, Chapters 6, 7, 8 Byrne & van De Vijver (2010)	
		3/12		Special issues (cont)			
10		3/16-3/20		**Spring Break**			
11		3/24		Paper Proposal Review Review Homework 6 Latent Path Models: Specification		Kline Chapter 10 Cole & Maxwell (2003)	***Paper Proposal Due Today 3/24 by class time*** <u>Homework 7</u> (**due 3/31**): Specifying a LVP Model
		3/26		Latent Path Models: Specification (cont)			
12		3/31		Latent Path Models: Programming and Estimation		Kline Chapter 14	<u>Homework 8</u> (**due 4/7**): Running a LVP Model
		4/2		Latent Path Models (cont) Review Homework 7			
13		4/7		Longitudinal models		Kline Chapter 15 Byrne et al. (2008)	<u>Homework 9</u> (**due 4/14**): SEM model for project

		4/9		Final issues: Missing data, categorical & non-normal data, power & sample size Review Homework 8		Wolf et al. (2013) Brown, Chapters 9, 10, 11	
14		4/14		Writing it up		Kline Chapter 18	
		4/16		Flex class; Review Homework 9			
15		4/21		Class Presentations			
		4/23		Class Presentations			
16		4/28		Class Presentations			
		4/30		Class Presentations		***Final paper due May 4 by 5pm***	

Disclaimer: In the event of a major campus emergency, the above requirements, deadlines and grading policies are subject to changes that may be required by a revised semester calendar. I also reserve the right to make changes to the schedule based on needs of the course or instructor. Any such changes in this course will be posted, once the course resumes, on the course website or can be obtained by contacting the instructor via email or phone.