



<b>Course title:</b>	Applied Structural Equation Modeling	
<b>Course #/term:</b>	SW 863 001, Fall, 2020	
<b>Time and place:</b>	Thursdays: 9:00AM to 12:00PM Online Sessions over Zoom (Link <a href="#">HERE</a> )	
<b>Credit hours:</b>	3	
<b>Prerequisites:</b>	Doctoral level or permission from the instructor	
<b>Instructor:</b>	Anao Zhang	
<b>Pronouns:</b>	He/Him/His	
<b>Contact info (Zhang):</b>	<b>Email:</b> <a href="mailto:zhangan@umich.edu">zhangan@umich.edu</a>	<b>Phone:</b> (734) 647-6787
<b>Office:</b>	SSW 3704	
<b>Office hours (Zhang):</b>	Friday 2:00 – 4:00PM or By appointment	

## 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 packages R and Mplus will be the primary analysis tools 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 mainstream statistical software to run SEM models, i.e., R, Mplus, and STATA.

## **b. Course design**

This course is delivered entirely online and will use a mixture of pedagogical methods such as: remote class discussions, small group work, experiential/simulated exercises to facilitate understandings of the course content. Asynchronous and Synchronous class sessions will include a lecture or presentation, accompanied by an applied Lab Session (almost weekly). Because it is a doctoral level method course, I expect all students will take responsibilities in their own learning and will not pose too many parameters in evaluating students' performances except those making sure that you have mastered the content.

Later in this syllabus, there will be an elaborated paragraph on students' conduct during weekly synchronous and asynchronous sessions.

## **c. Course focus on PODS**

Attention to Privilege, Oppression, Diversity, and Social Justice (PODS) is at the very core of social work education, including method classes at the doctoral level. Specifically in this class, topics related to theory construction and data analysis will be demonstrated primarily through PODS related examples. For example, discussions on moderated mediation analysis will be contextualized using minority stress theory. Students will be encouraged to construct and practice their own theory construction using scientific theories and conceptual frameworks that are PODS-related.

## **2. Class Requirements**

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### **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. However, I will 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 Canvas 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. There will not be a primary text book for this class, but I will address different text books in the beginning of the class, making sure students who are interested in learning more will find the right text for them.

Because it will be an online course, you will find all needed documents for asynchronous, synchronous, and between session content on Canvas.

### c. Class schedule

[Below is a tentative outline. Actual schedule will be based on students' feedback and classroom responses.]

Date/Time	Agenda
Week 1 Sep. 3 <sup>rd</sup>	Lesson 1: Course instruction and basic review of introductory statistics
Week 2 Sep. 10 <sup>th</sup>	Lesson 2: Connecting your existing statistical knowledge to the SEM framework
Week 3 Sep. 17 <sup>th</sup>	Lesson 3: SEM as THE statistical framework for theory construction, bridging the gap between data analysis and theory advancement
Week 4 Sep. 24 <sup>th</sup>	Lesson 4: Basics of SEM, data structure, and estimation methods 1
Week 5 Oct. 1 <sup>st</sup>	Lesson 5: Basics of SEM, data structure, and estimation methods 2
Week 6 Oct. 8 <sup>th</sup>	Lesson 6: Psychometric models
Week 7 Oct. 15 <sup>th</sup>	Lesson 7: Path models and fit statistics 1
Week 8 Oct. 22 <sup>nd</sup>	Lesson 8: Path models and fit statistics 2
Week 9 Oct. 29 <sup>th</sup>	Lesson 9: Model improvement and refinement
Week 10 Nov. 5 <sup>th</sup>	Lesson 10: Semester check-in: allows for student question and consolidates what we have learned so far

Date/Time	Agenda
Week 11 Nov. 12 <sup>th</sup>	Lesson 11: Advanced Topic, mediation analysis
Week 12 Nov. 19 <sup>th</sup>	Lesson 12: Advanced Topic, multiple group analysis (moderation)
Week 13 Nov. 26 <sup>th</sup>	HAPPY THANKSGIVING
Week 14 Dec. 3 <sup>rd</sup>	Lesson 13: A third advanced topic if time permits (though unlikely)

#### d. Assignments

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

#### e. Attendance and class participation

We will continue to face many uncertainties in the fall semesters, so your physical attendance to each week's session is not mandated. However, it is **critical and required** that you watch all the session recordings, including both asynchronous and synchronous sessions if you must miss one session. Professional conduct is expected when it comes to your course attendance and class participation **using the following guidelines**:

1. You are expected to communicate an expected absence of a synchronous session at least 24 hours before the session with a clear plan on how and when you will finish watching the session recording before next week's new content.
2. You are expected to communicate with the instructor as soon as you can (typically within 72 hours) after an unexpected absence of a synchronous session.
3. It is required that you keep your video camera on most times and for most sessions to facilitate engaged learning. You should communicate in advance with the instructor about any foreseeable challenges of doing so with a strong rationale.
4. It is required that you submit your assignment before the due date, and you will typically have 7 calendar days once an assignment has been created. For any (un)expected late submission of your assignment, you should use the same timeline as indicated above in bullet points 1 and 2.
5. Students are encouraged to implement a parallel course project using their own data. However, your parallel course project cannot be used to replace the course assignment.

## f. Grading

Course grading will be discussed in detail in class.

## g. Statistical Software

The primary statistical software for this class will be R and Mplus. Accommodation to STATA user will be provided, but please be kindly aware that I (Anao Zhang) is not a STATA programmer. With that said, I will support those students who are most comfortable with STATA with their programming needs if neither R nor Mplus is familiar to them. Although Mplus is the state-of-the-art software running SEM, I also understand accessibility challenges to Mplus especially during COVID-19, a period access to your lab or doctoral student office is limited.

To download R, please make sure that you download both [R software](#) and [R studio](#). To download Mplus, use this [Link](#). There is a (free) demo version, a relatively inexpensive student version, and a set of rather expensive full version.

To download STATA, use this [Link](#).

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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*