Spring 2014 Psychology 948: Latent Trait Measurement and Structural Equation Models

Instructor:	Dr. Lesa Hoffman	Materials:	http://psych.unl.edu/psycrs/948/index.html
Email:	Lesa@unl.edu	Homework:	http://psych.unl.edu/psycrs/948hw/index.asp
Rooms:	77 and 234 Burnett Hall	Office:	219 Burnett Hall
Time:	9:00–11:50 Mondays	Office Hours:	1:30–3:30 MW

Schedule of Topics and Events:

The online syllabus at the web address provided above will always have the most current information.

Course Objectives, Materials, and Pre-Requisites:

This course will feature contemporary approaches to measurement, expanding from classical test theory into confirmatory factor models, item response models, and their use within structural equation models. In addition to the statistical models, the course will also focus on the measurement concepts behind these models and how they relate to each other with respect to scale construction and evaluation. Class time will be devoted primarily to lectures and examples. Lecture materials in .pdf format will be available electronically at the course website above prior to each class. Audio/Video recordings of the class lectures in .mp4 format will also be posted online, but are not intended to take the place of class attendance. In addition to the primary textbook (see below), supplemental book chapters and journal articles will be assigned for each topic; the list of readings below will be updated as needed. All supplemental readings will be available electronically within the online homework portal.

Because the course will have an applied focus using *Mplus* software, portions of the class and instructor office hours will be held in the 234 Burnett computer lab to provide opportunities for in-class practice and to work on homework assignments and receive immediate assistance. Participants will need access to *Mplus* software, which is available in rooms 234, 227, and 230 Burnett and online through the Tusker computing cluster (see the course webpage for access instructions). Finally, participants should be familiar with the general linear models and multivariate modeling using maximum likelihood (as covered in PSYC 941, 942, and 943 or the equivalent) prior to enrolling in this course.

Academic Honesty:

As a reminder, the University has a policy on academic honesty (see the Graduate Studies Bulletin for further details). All course assignments should be done individually.

Accommodating Students with Disabilities:

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of UNL to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

Course Requirements:

Course performance will be evaluated using 8 homework assignments designed to give participants hands-on practice applying the techniques discussed in class and will be due as listed on the online syllabus. Assignments will include data analysis, results interpretations, and other questions. Successfully running *Mplus* software through the HCC will also be required (3 homework points). In addition, "Homework 0" will be worth 3 bonus points to familiarize participants with the online homework system.

Homework assignments will fall into two categories: common data and individual data. **Assignments using common datasets will be administered and submitted using the online homework portal.**

Assignments using individual datasets will be submitted through UNL Blackboard and returned via the online homework portal. Assignments using individual datasets must be **at least 3/4 complete** in order to be accepted and may be revised ONCE to earn the maximum points (due by the end of semester, submitted via Blackboard). All individual assignments should be submitted as a Microsoft Word document using this naming convention: **948HW#_Firstname_Lastname** (adding an "r" to the end of the # for a revision). Please use the track changes function in Word and leave in all previous instructor comments when revising assignments.

Policy on Late Homework Assignments and Incompletes:

In order to be able to provide the entire class with prompt feedback, **late homework assignments will incur a 3-point penalty**. However, extensions will be granted as needed for extenuating circumstances (e.g., conferences, family obligations) if requested **at least three weeks in advance of the due date**. Finally, a grade of "incomplete" will only be given in the event of extremely dire circumstances.

Final grades will be determined by number of points earned out of 100 possible:

≥97 = A+ 93-96 = A 90–92 = A- 87-89 = B+ 83-86 = B 80-82 = B- < 80 = C or no pass

Primary Course Text:

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford.

Supplementary Readings:

Bauer, D. J., & Hussong, A. M. (2009). Psychometric approaches for developing commensurate measures across independent studies: Traditional and new models. *Psychological Methods, 14*(2), 101-125.

DeMaris, A. (2003). Logistic regression. In J. A. Schinka & W. F. Velicer (Eds.), *Research methods in psychology* (Vol. 2, pp. 509-532). New York, NY.

Edwards, M. C., & Wirth, R. J. (2009). Measurement and the study of change. *Research in Human Development, 62*(2-3), 74-96.

Embretson, S. E. (1983). Construct validity: Construct representation versus nomothetic span. *Psychological Bulletin, 93*(1), 179-197.

E & R: Embretson, S. E., & Reise, S. T. (2000). *Item response theory for psychologists*. Mahwah, NJ: Erlbaum.

Enders, C. K. (2010). *Applied missing data analysis*. New York, NY: Guilford.

John, O. P., & Benet-Martinez, V. (2000). Measurement: Reliability, construct validation, and scale construction. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 339-369). New York, NY: Cambridge University Press.

McDonald, R. P. (1999). *Test theory: A unified treatment*. Mahwah, NJ: Erlbaum.

McGraw, K. O., & Wong, S. P. (1996). Forming inferences about some intraclass correlation coefficients. *Psychological Methods, 1*(1), 30

Mungas, D., & Reed, B. R. (2000). Application of item response theory for development of a global functioning measure of dementia with linear measurement properties. *Statistics in Medicine, 19*, 1631-1644.

Preacher, K. J., & MacCallum, R. C. (2003). Repairing Tom Swift's electric factor analysis machine. *Understanding Statistics, 2*(1), 13-43.

Rijmen, F., Tuerlinckx, F., De Boeck, P., & Kuppens, P. (2003). A nonlinear mixed model framework for item response theory. *Psychological Methods, 8*(2), 185-205.

Sheu, C.-F., Chen, C.-T., Su, Y.-H., & Wang, W.-C. (2005). Using SAS PROC NLMIXED to fit item response theory models. *Behavior Research Methods, 37*(2), 202-218.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*(1), 4-69.

Wirth, R. J., & Edwards, M. C. (2007). Item factor analysis: Current approaches and future directions. *Psychological Methods, 12*(1), 58-79.

Tentative Schedule of Events:

Week	Date	Topics	Readings
1	1/13	Course Introduction Lecture 1: Introduction to Latent Trait Measurement Models, Items, and Scales Lecture 2: Exploratory Factor Analysis and Principal Components Analysis	John & Benet-Martinez (2000) Preacher & McCollum (2003) Brown ch. 2
	1/17	**HW0 Due by 11:59 PM**	
2	1/20	**NO CLASS (or office hours)**	
	1/24	**HW1 Due by 11:59 PM**	
3	1/27	Lecture 3: Classical Test Theory for Assessing Scale Reliability and Validity Example 3: Classical Items Analysis in SPSS and SAS Lecture 4: Confirmatory Factor Analysis Example 4: Confirmatory Factor Models in *Mplus*	McDonald ch. 5-7 McGraw & Wong (1996) Brown ch. 3
	1/31	By now you will need to have successfully registered for Tusker and submitted an Mplus script for analysis (3 HW points).	
4	2/3	Lecture 4 and Example 4, continued 234 Lab: Introduction to *Mplus* for Confirmatory Factor Analysis	Brown ch. 4-5 Enders (2010) ch. 3, 5
	2/7	**HW2 Due by 11:59 PM**	
5	2/10	Lecture 5: Introduction to Generalized Models Lecture 6: Latent Trait Measurement Models for Binary Responses Example 6: Binary Item Response Models in *Mplus*	DeMaris (2003) E & R (2000) ch. 3-4 Mungas & Reed (2000)
6	2/17	Lecture 6 and Example 6, continued 234 Lab: More *Mplus* for Binary Response Models	E & R ch. 7-8 Wirth & Edwards (2007)
	2/21	**HW3 Due by 11:59 PM**	
7	2/24	Lecture 7: Latent Trait Measurement Models for Other Item Responses Example 7a: Graded Response Models for Ordinal Responses in *Mplus* 234 Lab: More *Mplus* for Graded Response Models	E & R ch. 5 Bauer & Hussong (2009)
8	3/3	Lecture 7, continued Example 7b: Item Response Models in SAS NLMIXED Lecture 8: Explanatory Item Response Models Example 8: Explanatory Item Response Models in SAS GLIMMIX	Sheu et al. (2005) Embretson (1983) Rijmen et al. (2003)
	3/7	**HW4 Due by 11:59 PM**	

9	3/10	Lecture 9: Higher-Order Factor Models Example 9: Higher-Order CFA and IRT Models in *Mplus* 234 Lab: Alternatives to Higher-Order Factor Models	TBD
10	3/17	**NO CLASS (or office hours)**	
	3/21	**HW5 Due by 11:59 PM**	
11	3/24	**NO CLASS (or office hours)**	
12	3/31	Lecture 10: Measurement Invariance in CFA Example 10a: Multiple-Group Measurement Invariance in CFA using *Mplus*	Brown ch. 7-8 Vandenberg & Lance (2000)
	4/4	**HW6 Due by 11:59 PM**	
13	4/7	Example 10b: Longitudinal Measurement Invariance in CFA using *Mplus* Lecture 11: Measurement Invariance in IFA Example 11: Multiple-Group Measurement Invariance in IFA using *Mplus*	Edwards & Wirth (2009) TBD
14	4/14	Lecture 12: Path Modeling and Mediation Example 12a: Path Modeling with Mediation in *Mplus* Example 12b: Path Modeling with Non-Normal Outcomes in *Mplus*	TBD
	4/18	**HW7 Due by 11:59 PM**	
15	4/21	Lecture 13: Structural Equation Modeling Example 13: Structural Equation Modeling in *Mplus*	TBD
16	4/28	Lecture 13 and Example 13, continued	
	5/2	**HW8 Due by 11:59 PM**	
17	5/5	**All homework revisions due by 11:59 PM**	