

Fall 2009 Psychology 948: Latent Trait Measurement Models

Instructor:	Dr. Lesa Hoffman	Website:	http://psych.unl.edu/psycrs/948.index.html
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Rooms:	77 and 227/234 Burnett Hall	Office:	220 Burnett Hall (mailbox in 237 Burnett)
Time:	1:15-2:30 MWF (3 credits)	Office Hours:	2:30-3:30 MWF, 3:30-4:30 WF, and by appt.

Course Pre-Requisites and Objectives:

This course will illustrate contemporary approaches to measurement, expanding from classical test theory into confirmatory factor models and item response models. In addition to the statistical models, however, the course will also focus on the measurement concepts behind these models and how they compare and contrast with 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 for download at the website above the day prior to each class, or else paper copies will be provided in class. Audio recordings of the class lectures in .mp3 format will also be posted online, but are not intended to take the place of class attendance. Because the course will be applied, course sessions will also be held in the 227 and 234 Burnett computer lab (see syllabus for dates), in which participants will have opportunities for hands-on practice and to work on course assignments. The primary program utilized will be Mplus, although additional programs may be brought in as needed. Lab time will be used to provide instruction with each program used; no prior experience with any program (other than SPSS or SAS) is assumed.

Participants should be familiar with the general linear model (analysis of variance, regression) prior to enrolling in this course, but no previous familiarity with measurement or structural equation modeling (other than exploratory factor analysis) is assumed. Participants will need access to Mplus software. Mplus is available in rooms 234, 227, and 230 Burnett. Student licenses are expensive (\$200 for the base program), but may be worth the cost if these models are something you're likely to need frequently (but they do not expire yearly as do other programs). Course assignments will include both essay questions and application of techniques discussed in class, and will utilize data sets provided by the instructor. Participants are strongly encouraged to use an item-level dataset within their substantive area for the final project, but example data sets can also be made available. Requirements for the final project dataset will be discussed in more detail throughout the semester. Finally, this course is intended to serve as a precursor to a course in Structural Equation Modeling (to be taught spring 2010 in EDPS).

Course Requirements: Course performance will be evaluated as follows. Details about each requirement will be presented throughout the semester prior to the due dates.

Course Assignments: Three assignments (65 points) will be administered in order to give participants the practice applying techniques discussed in class and will be due as listed on the online syllabus. Each assignment must be at least 3/4 complete in order to be accepted and may be revised ONCE to earn the maximum possible points. Assignments should be submitted electronically via email as a Microsoft Word document using this naming convention: 948_FirstLast_HW# (adding an "r" for a revision). Please use the 'track changes' function in Microsoft word when revising assignments.

Final Project and Presentation: Participants will complete an independent project utilizing ideas and techniques discussed through the semester (25 points) and will be due as noted on the online syllabus. The results of the project will also be presented in a 12-minute talk (10 points), to be given at the end of the semester. A project outline (5 points) will be due prior to the end of the semester as noted on the syllabus.

Final grades will be determined by number of points earned out of 105 possible points:

≥97 = A+ 93-96 = A 90-92 = A- 87-89 = B+ 83-86 = B 80-82 = B- < 80 = C

Policy on Assigning Incompletes: A grade of "incomplete" will be assignment ONLY in the case of extenuating circumstances that prevent participants from completing course requirements in a timely manner. If an incomplete is assigned, then all course requirements must be completed within ONE MONTH of the end of the course or else the incomplete will turn into whatever grade has been earned at that point.

Policy on Late Assignments: If other obligations or circumstances will prevent you from completing any course requirements, please contact me so that we can create a solution. Don't wait until you are behind! If you contact me at least two weeks prior to a due date we may be able to extend the deadline to accommodate any

extenuating circumstances. Otherwise, late assignments will be docked .5 points per day in order to encourage participants to keep up with the course. Points lost to lateness will not be returned.

Academic Honesty:

As a reminder, the University has a policy on academic honesty (see the Graduate Studies Bulletin). Although data sets may be shared, all course assignments should be done individually and all final projects should be unique.

Accommodating Persons 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 the University of Nebraska-Lincoln 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.

Primary Course Texts:

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

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

All supplementary readings will be available via the course documents on UNL Blackboard:

Book Chapters:

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

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

Journal Articles:

Atkins, D. C., & Gallop, R. J. (2007). Rethinking how family researchers model infrequent outcomes: A tutorial on count regression and zero-inflated models. *Journal of Family Psychology*, 21(4), 726-735.

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.

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.

Kamata, A., & Bauer, D. J. (2008). A note on the relation between factor analytic and item response theory models. *Structural Equation Modeling*, 15, 136-153.

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

Meade, A. W., & Bauer, D. J. (2007). Power and precision in confirmatory factor analytic tests of measurement invariance. *Structural Equation Modeling*, 14(4), 611-635.

Millsap, R. E., & Yun-Tein, J. (2004). Assessing factorial invariance in ordered-categorical measures. *Multivariate Behavioral Research*, 39(3), 479-515.

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 NL MIXED to fit item response theory models. *Behavior Research Methods*, 37(2), 202-218.
- Smith, E. V., Jr. (2001). Evidence for the reliability of measures and validity of measure interpretation: A Rasch measurement perspective. *Journal of Applied Measurement*, 2(3), 281-311.
- Templin, J. L., & Henson, R. A. (2006). Measurement of psychological disorders using cognitive diagnosis models. *Psychological Methods*, 11(3), 287-305.
- 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 and Downloads	Readings & Manuals
1a	8/24	Course Introduction Lecture: Introduction to Latent Trait Measurement Models	
1b	8/26	Lecture: Concepts in Item and Scale Construction	McDonald ch. 2-4
1c	8/28	Lecture: Classical Test Theory Approaches to Validity	John & Benet-Martiez (2000)
2a	8/31	Lecture: Classical Test Theory Reliability and Items Analysis Part 1	McDonald ch. 5-7
2b	9/02	Lecture: Classical Test Theory Reliability and Items Analysis Part 2	McGraw & Wong (1996)
2c	9/04	Example: Reliability Analysis using SPSS and SAS	
3a	9/07	NO CLASS – Labor Day	
3b	9/09	Final Project Available Begin Assignment #1: Classical Items Analysis Lecture: Exploratory Factor Analysis and Principle Components Analysis	Preacher & McCollum (2003)
3c	9/11	EFA and PCA, continued	Brown ch. 2
4a	9/14	NO CLASS	
4b	9/16	MEET IN 227 LAB -- Introduction to Mplus	
4c	9/18	Assignment #1 due via email by 11:59 PM Lecture: Confirmatory Factor Models Part 1: Model Identification	Brown ch. 3-4
5a	9/21	Feedback on Assignment #1 Example: Confirmatory Factor Models in Mplus	
5b	9/23	Lecture: Confirmatory Factor Models Part 2: Model Evaluation	Brown ch. 5
5c	9/25	Confirmatory Factor Models in Mplus example (5a), continued	
6a	9/28	Revisions of Assignment 1 due via email by 11:59 PM MEET IN 234 LAB -- Begin Assignment #2: Confirmatory Factor Models	
6b	9/30	MEET IN 227 LAB -- Open lab time for Assignment #2	
6c	10/02	Lecture: Confirmatory Factor Models Part 3: Higher-Order Factors Example: Confirmatory Factor Models with Higher-Order Factors in Mplus	Brown ch. 7-8
7a	10/05	Example (6c), continued	
7b	10/07	Assignment #2 due via email by 11:59 PM NO CLASS	
7c	10/09	NO CLASS	

Week	Date	Topics and Downloads	Readings & Manuals
8a	10/12	*Recommended due date for Parts 1 and 2 of Final Project* Lecture: Confirmatory Factor Models Part 4: Measurement Invariance	Vandenburg & Lance (2000)
8b	10/14	Example: Testing Measurement Invariance Across Groups in Mplus	Meade & Bauer (2007)
8c	10/16	Feedback on Assignment 2 Example: Testing Measurement Invariance Over Time in Mplus	
9a	10/19	NO CLASS – FALL BREAK	
9b	10/21	Lecture: Logistic and Other Generalized Models	DeMaris (2003)
9c	10/23	Revisions of Assignment 2 due via email by 11:59 Lecture: Item Response Models Part 1: Binary Response Models	E & R ch. 2-4
10a	10/26	Example: Binary Response Models in Mplus	Kamata & Bauer (2008)
10b	10/28	Lecture: Item Response Models Part 2: Item and Test Information	E & R ch. 1, 6
10c	10/30	Lecture: Item Response Models Part 3: Polytomous Response Models	Mungas & Reed (2000) E & R ch. 5
11a	11/02	*Final Project Outline due via email by 11:59 PM* Example: Graded Response Models in Mplus Bonus Example: IRT Models using SAS NL MIXED	Wirth & Edwards (2007) Sheu et al. (2005)
11b	11/04	Lecture: Item Response Models Part 4: Model Estimation and Evaluation	E & R ch. 7-8
11c	11/06	Examples (10b) and (11b), continued	
12a	11/09	MEET IN 234 LAB -- Begin Assignment #3: Item Response Models	
12b	11/11	MEET IN 227 LAB -- Open lab time for Assignment #3	
12c	11/13	Lecture: Item Response Models Part 5: Differential Item Functioning	E & R ch. 10
13a	11/16	NO CLASS	
13b	11/18	Assignment #3 due via email by 11:59 PM Example: Testing Differential Item Functioning across Groups in Mplus	Millsap & Yun-Tein (2004) Edwards & Wirth (2009)
13c	11/20	Example: Other Generalized Measurement Models in Mplus	Atkins & Gallop (2007)
14a	11/23	Feedback on Assignment 3 Lecture: Validity via Explanatory Latent Trait Models	Embretson (1983) Rijmen et al. (2003) Smith (2001)
14b	11/25	NO CLASS – THANKSGIVING BREAK	
14c	11/27	NO CLASS – THANKSGIVING BREAK	
15a	11/30	*Recommended due date for Part 3 of Final Project* Lecture and Example: Diagnostic Classification Models	Templin & Henson (2006)
15b	12/02	Lecture: A World View of Models	
15c	12/04	Revisions of Assignment #3 are due via email by 11:59 PM Lectures, continued and Course Evaluations	
16a	12/07	Student Presentations	
16b	12/09	*Last Day to Turn in Drafts of Final Project* Student Presentations	
16c	12/11	Student Presentations	
17	12/16	Complete Final Project due via email by 11:59 PM	