

EDF5432
Measurement Theory I
Spring 2010
Department of Educational Psychology & Learning Systems
Florida State University

<p>Instructor: Mustafa Kuzey Bilir, Ph.D.</p> <p>Class hour: MW 5:15 -6:30pm</p> <p>Class room: HCB 0217</p> <p>Office: 3204J Stone Building</p> <p>Email: kbilir@fsu.edu</p> <p>Office hours:</p> <p>W 3:30-5:00 pm</p> <p>R 1:00-2:30 pm or by appointment</p>	<p>TA's office: STB3207</p> <p>Kyunghwa Cho (kc07h@fsu.edu)</p> <p>Hulya Yurekli (hy08c@fsu.edu)</p> <p>Seung-Jin Lee (sl02e@fsu.edu)</p> <p>Office hours:</p> <p>Kyunghwa Cho: M 12:00pm-1:30pm</p> <p>Hulya Yurekli: TBA</p> <p>Seung-Jin Lee: TBA</p>
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Prerequisite: EDF5400 (Basic Statistics) or equivalent and EDF5401 (General Linear Models) or equivalent are required.

Course Description

This course introduces the basic theory and applications of psychometrics to be applied to psychological tests, including achievement test, questionnaire, and attitude survey. It is designed for students who wish to learn basic theory and techniques of item analyses, including reliability and validity analyses. Classical test theory, confirmatory factor analysis, and item response theory will be covered.

Textbooks

Required Textbook

- Osterlind, S. J. (2006) Modern measurement: Theory, principles, and applications of mental appraisal. Upper Saddle, NJ: Pearson.

Recommend Books

- McDonald, R.P. (1999). Test theory: A unified treatment. Mahwah, NJ: Lawrence Erlbaum.
- Muthen & Muthen (2006). Mplus user guide. (can be downloaded from www.statmodel.com)

Required Readings

- Abell, N., Springer, D. W., & Kamata, A. (2009). Developing and Validating Rapid Assessment Instruments. Oxford University Press. (Ch. 6)
- Borsboom, D., Mellenbergh, G. J., van Heerden, J. (2004)*, The concept of validity. *Psychological Review*, 111(4), 1061-1071.
- Kamata, A., & Vaughn, B.K. (2004). An introduction to differential item functioning analysis. *Learning Disabilities: A Contemporary Journal*, 2, 49-69.
- Osburn, H.G. (2000)*. Coefficient alpha and related internal consistency reliability coefficients. *Psychological Methods*, 5(3), 343-355.
- Schmitt, N. (1996)*. Uses and abuses of coefficient alpha. *Psychological Assessment*, 8(4), 350-353.

* Article is available online through FSU library.

Course Objectives

At the end of the semester, students are expected to be able to understand;

1. why psychometric analyses are important for psychological tests.
2. the definition of reliability of psychological tests.
3. Coefficient alpha as a lower-bound estimate of reliability.
4. Coefficient alpha can be the estimate of reliability when tau-equivalent assumption is satisfied.
5. reliability can be expressed by factor loading and uniqueness in factor analysis.
6. Spearman-Brown approach to estimate change of reliability when test length is altered.
7. split-half method to estimate reliability.
8. the concept of validity.
9. MTMM matrix approach to collect validity evidence.
10. exploratory factor analysis approach to collect validity evidence.
11. confirmatory factor analysis approach to collect validity evidence.
12. the basic principal of item response theory (IRT) for dichotomously scored test items.
13. characteristics of item- and person-parameters in IRT.
14. some procedures to detect differential item functioning (DIF).

In order to achieve these objectives, students will engage in data analyses activities in projects, including;

1. reliability analyses to of a test by estimating reliability measures from different point of views.
2. validity analyses to support construct evidence of validity by both exploratory and confirmatory factor analysis, as well as by a MTMM matrix.
3. item analyses by item response theory to obtain and interpret item parameters and latent score estimates.

Course website and e-mail

A course website has been set up through the Blackboard (Bb) System. Lecture notes (mostly .pdf versions of PowerPoint files), assignments and other resources will be available from this web site. As needed, course-related announcements will be posted on the course website. By default, only announcements posted the same day are displayed on the opening page. Therefore, get in the habit of clicking on the tab within the announcements page that displays announcements posted during the last 7 days.

Any course-related e-mail that I initiate will be sent to your e-mail address listed on the Blackboard system (this is usually your garnet account, by default). If you don't check your garnet mail often, please set up a preferred alternate address on the Blackboard system or arrange automatic forwarding service from your Garnet account to a preferred alternate address.

Grades

Grades will be based on points accumulated on assignments and examinations. There will be 100 total possible points, distributed as follows:

3 Assignments	45% (15% each)
2 Tests	50%
Attendance and Participation	5%

Grading Scale		
Lower%	Upper%	Grade
93.00%	100.00%	A
90.00%	92.99%	A-
87.00%	89.99%	B+
83.00%	86.99%	B
80.00%	82.99%	B-
70.00%	79.99%	C
60.00%	69.99%	D

Assignments

- Assignments provide you opportunities to analyze hypothetical data set to perform item analysis.
- Three assignments will make up the points devoted to homework. The first assignment is mainly about reliability analysis, the second assignment is mainly about analyses to collect construct validity evidence, and the third assignment is mainly about item response theory analyses.
- Always submit your output with your homework.

- Total homework points will be converted to a percentage score, then weighted and combined with exam scores to obtain a final overall grade.
- Each student should be in a group of 2 or 3 students. Each group is expected to submit one set of answers. However, exchanging and sharing written answers between groups are strictly prohibited, and answers **MUST** be written independently from other groups. Any violation to this requirement will be considered as violation of the Academic Honor Code of FSU, and appropriate actions will be taken by the instructor.
- **If you would like to appeal any grade on your homework you must make the appeal in writing to our teaching assistant. You must wait at least one day after the homework has been returned to you.**
- Each student is given a total of 7 late days (including weekend) that can be used throughout the semester without any consequence to the final grade. The first late day begins immediately after students have been asked for the assignments to be turned in class. **If assignment is turned in after the class period of time, it will be counted to be 1 late day.** You may use one late day on each assignment, or all 7 days on one assignment. If more than 7 late days are accumulated, it will affect your final course grade, as described below.

Number of late days	Consequences
8-10	Final percentage grade reduced by 5 points (e.g., 100 points to 95 points)
11-13	Final percentage grade reduced by 10 points (e.g., 100 points to 90 points)
14 or more	Possible failure.

ALL of your assignments must be submitted by 5:15 pm by the announced deadline for prompt grading.

Note: You are responsible for obtaining materials in case you are absent in a class.

Late Homework

- Late homework should be first turned in **electronically** via e-mail to me. The late days will be counted based on the date and time of your received electronic submission. A hardcopy of the late homework have to be submitted in person at the next class session

Electronic Submission

- You can submit your homework electronically via e-mail to the instructor. However, you have to submit a hardcopy for your homework to be graded.

Exams

The midterm exam will be taken at a regular class time within the semester. Final exam will be taken at the regular class time on Wednesday 4/21. Both midterm and the final exam are open-book and open-note, and on both exams you will need to use calculators. However, books, notes, and calculators may NOT be shared during exams, so be sure to bring your own materials!

Software Use

This course will require the use of SPSS and Mplus. SPSS is general statistical package software, while Mplus is specialized software for structural equation modeling (SEM). SPSS is available on many lab computers on campus, including LRC lab in Stone building. Mplus is available on 6 terminals in the COE lab. If you wish to know more about Mplus, visit www.statmodel.com.

Honor Code

Students at FSU are expected to uphold the Academic Honor Code published in The Florida State University Bulletin and the Student Handbook and found online at <http://dof.fsu.edu/honorpolicy.htm>. The Academic Honor System of The Florida State University is based on the premise that each student has the responsibility (1) to uphold the highest standards of academic integrity in the student's own work, (2) to refuse to tolerate violations of academic integrity in the university community, and (3) to foster a high sense of integrity and social responsibility on the part of the university community. Academic dishonesty, including copying and plagiarism, may result in failure of this course.

Students with Disabilities

Students with disabilities needing academic accommodation should (1) register with and provide documentation to the Student Disability Resource Center; and (2) bring a letter to your instructor indicating the need for accommodation and describing the type of accommodation needed. This should be done during the first week of class.

Schedule (subject to change)

Week	Assignments (Due)	Topics	Reading
1/2		<ul style="list-style-type: none">• Introduction to psychological measurement• Statistics for dichotomous variable• Variance of a composite variable	Ch.1 Ch.2
3		<ul style="list-style-type: none">• Reliability and the Classical True Score Model 1	Ch.3
4		<ul style="list-style-type: none">• Reliability and the Classical True Score Model 2• Spearman-Brown formula• Coefficient-alpha formula	Ch.5 Osburn Schmitt
5		<ul style="list-style-type: none">• Factor analysis 1• Exploratory Factor Analysis• Confirmatory Factor Analysis	ASK Ch.6

6		<ul style="list-style-type: none"> • Factor analysis 2 • EFA & CFA, continued • CFA approach to estimating reliability 	
7	Assignment 1	<ul style="list-style-type: none"> • Reliability – Extensions • Stratified alpha • Reliability and FA – Reviews 	
8		Validity 1 <ul style="list-style-type: none"> • Facets of validity • Collecting validity evidence by Factor Analysis 	Ch.4
9		Test 1	
		SPRING BREAK	
10		Validity 2 <ul style="list-style-type: none"> • MMTM matrix 	
11		<ul style="list-style-type: none"> • Item Response Theory 1 • Some IRT models for dichotomous items 	Ch.10
12	Assignment 2	<ul style="list-style-type: none"> • Item Response Theory 2 • Estimation of item parameters & trait levels 	ASK Ch.6
13		<ul style="list-style-type: none"> • Item Response Theory 3 • Information Function • Computer Adaptive Test 	
14		<ul style="list-style-type: none"> • Validity 3 • Factorial Invariance between subpopulations 	
15		Test 2	
15		Validity 4 <ul style="list-style-type: none"> • Differential Item Functioning between subpopulations 	Kamata & Vaughn
16	Assignment 3	<ul style="list-style-type: none"> • Due April 26 (Monday of the final examination week) 	