

## **Psychometric Theory I**

<b>Course Delivery</b>	Online through Rutgers Learning Studio (provided by Pearson eCollege)
<b>Instructor</b>	Jinnie Choi, Ph.D.
<b>Email</b>	jinnie.choi@rutgers.edu. Instead of emailing, I encourage you to post a private message to me within 'Virtual Office Hours' (by means of Piazza discussion board) on the course website.
<b>Office Hours</b>	'Virtual Office Hours' by means of Piazza discussion board.
<b>Prerequisites</b>	Statistical Methods in Education I (15:291:531) or the equivalent (16:960:531 or 15:291:511). Basic statistical knowledge is required throughout the course because some issues in the field are necessarily technical.

### **Course Catalog Description**

Psychological and statistical principles underlying test design, analysis, and interpretation with emphasis on classical psychometric theory; analysis of reliability and validity and their estimation; the development, analysis, and use of both norm-referenced and criterion-referenced tests; and introduction to scaling techniques.

### **Learning Goals**

Program goals: The master's of education degree in Educational Statistics, Measurement and Evaluation aims to provide students training in basic and intermediate statistical, measurement, and evaluation methods. It serves as a preparation for students interested in working in research institutions, and pursuing Ph.D. studies in educational statistics and measurement or a related field. The Ph.D. in Statistics and Measurement within the Learning, Cognition, Instruction, and Development concentration prepares students to become statisticians and psychometricians with broad expertise in applied statistics, measurement theory, educational assessment and statistical analysis. An important feature of the program is early exposure to research and active learning through a variety of course offerings.

Course goals: This course is designed to provide an overview of basic but important topics and issues in educational and psychological testing and measurement. The course aims to offer

fundamental knowledge and techniques required to analyze educational and psychological tests from the perspective of psychometrics.

After successfully completing this class students should achieve the following goals.

Goal 1. Understand the fundamental concepts, methods, and principles of educational and psychological measurement. Specific objectives are as follows:

- Understand the purposes and methods of score transformation, conduct the score transformation, and interpret the results
- Be able to obtain and interpret reliability and validity related evidence
- Understand the general procedures for test construction and item writing
- Be able to conduct an item/test analysis from the classical test theory perspective
- Understand the general principles of the item response theory and its applications

Goal 2. Be more measurement literate. That is, be able to read, interpret, and critically evaluate measurement methodology, reported outcomes, and subsequent interpretations, as found in educational or behavioral research journals.

### **Class Materials**

#### Required texts:

Allen, M. J. & Yen, W. M. (2002). Introduction to Measurement Theory. Prospect Heights, IL: Waveland Press.

#### Recommended:

Crocker, L. & Algina, J. (1986). Introduction to Classical & Modern Test Theory.

Wilson, M. (2005). Constructing Measures: An Item Response Modeling Approach.

Thorndike, R. M. (2005). Measurement and Evaluation in Psychology and Education. (7th ed.).

Course materials: The course materials include lecture slides (plus voice), readings, homework assignments, and weekly participation topics. All materials will be offered online.

Calculator: A calculator that performs basic operations is necessary for homework assignments, exercises, and exams.

### **Internet and Technology Requirement**

Very reliable access to the internet is required to successfully complete this course. Please make sure to have a reliable back-up plan in place (local library, friend's house, coffee shop) in case your primary access is not available when you plan to work on the class. Rutgers has a plethora of options for access on terminals (libraries, computing centers) and most buildings have wireless access for a laptop.

## **Weekly Schedule**

The class has lectures posted on Mondays and exercise activities posted on Thursdays.

## **Policy on Assignment Submission**

To maximize teaching and learning effects, you have to make sure you are able to read information, download files, drop messages to Question Box, do homework, and access your grades from the eCollege course homepage. All homework assignments and final projects should be submitted **ONLY** using the eCollege course homepage (Dropbox located on the top navigation bar), if not noted otherwise by the instructor. Other means of submission will not be guaranteed full credits, due to complications in feedback and grading.

All information and activities are time sensitive. Late responses and requests will not be handled. For example, you will have a run of time to finish each homework assignment. However, you will not be able to access the homework questions after the designated time. Should you submit an assignment after the due date, your grade will drop by 25% for each day late. Prior approval for a late assignment to receive full credit needs an acceptable reason: illness (with note from physician), family emergency, or religious holiday. In these cases, arrangements should be made with me as soon as possible for an alternative due date. Please follow all directions for both completing and submitting assignments. Send only required information.

## **Grading Rules**

The final letter grade will be assigned as follows: 90% and above - A, 80-89.99% - B+, 75-79.99% - B, 65-74.99% - C+, 60-64.99% - C, 55-59.99% - D, Below 55% - F.

1. Exams: There will be two take-home exams, midterm and final, which are worth 30% and 30% of the final grade, respectively.
2. Homework assignments: Approximately 4 homework assignments, worth 20% of the final grade, will be given during the semester. You have a whole week to work on a homework assignment. No late homework assignment is acceptable. Please refer to the "Course Schedule."
3. Final report: A report/critique from a self-selected journal paper that applies the theories and techniques covered in the course is worth 20% of the final grade. The final report/critique is due on April 29th. More detailed information about the final report will be distributed.
4. Online exercise activities: Approximately 8 exercises will be given throughout the semester, but will not be graded. The exercises are designed to help you understand the contents covered by lectures. Therefore, each exercise will be posted on *Thursdays* along with the answers. Discussion will be expected through the Question Box.
5. Extra handouts or readings: Depending on your questions and feedback, extra handouts or reading materials will be posted in addition to the regular lecture notes. These

materials are designed to explain difficult concepts covered in the lecture notes or help you better understand the topic for each week.

6. Reading assignments: Assigned readings must be completed prior to each lecture.
7. Participation: Your participation is expected throughout the semester.

### **Course Communications**

Question Box: One way to find the solution of your question is to simply post your questions online. A Basket labeled Question Box will be created every week for you to drop content-related questions. Your questions will be answered by the instructor. Therefore, please make sure you are familiar with the function, Dropbox. Note that some of your questions can also be handled in the discussion board (i.e., Chatroom) to help other students understand the same challenging issues.

Virtual Office Hours: In addition to the Question Box, another way to find your solution is to post your questions in the Virtual Office Hours (Piazza discussion board). It allows students post questions either to instructor or to the class, post comments to other students' questions (or any discussion topics), react to other students' comments, and respond to ideas shared by the instructor or by others in the course. Discussions take place at any time.

### **Academic Integrity Policy**

The Office of Student Conduct supervises issues related to violations of [academic integrity](#). Please familiarize yourself with the [university policy on academic integrity](#). As a student of Rutgers University you are responsible for adhering to the policies of this course and of Rutgers University, which includes the [Code of Student Conduct](#). By your continued enrollment in this class, it is understood that you are agreeing to all of the policies and procedures set forth in this syllabus. Failure to obtain or read this syllabus does not exempt the student from its policies and procedures. If you cannot abide by these policies and procedures, you are expected to drop the class. Failure to comply with the policies of this course and of the university can result in disciplinary action.

### **Office of Disability Services**

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation [here](#). If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site [here](#).

## Tentative Course Schedule

Check the course homepage for the most updated schedule.

The following class schedule is subject to change if necessary. Reading assignments must be completed each week.

<b>Week (Mon-Fri)</b>	<b>Topics to be Covered</b>	<b>Readings</b>
W1: Jan 17 (Tue)-Jan 20	Getting Started	
W2: Jan 23-Jan 27	Introduction; Basic Statistical Concepts	Ch. 1 & 2
W3: Jan 30-Feb 3	Transforming; Scaling; Equating	Ch. 7 & 8
W4: Feb 6-Feb 10 Feb 8 (Wed)	Classical Test Theory *HW 1 assigned	Ch. 3
W5: Feb 13-Feb 17 <b>Feb 14 (Tue)</b> Feb 15 (Wed)	Reliability <b>*HW 1 due</b> *HW 2 assigned	Ch. 4
W6: Feb 20-Feb 24 <b>Feb 21 (Tue)</b>	Reliability; Preparation for Midterm <b>*HW 2 due</b>	Ch. 4
<b>W7: Mar 3-4 (Fri-Sat)</b>	<b>Midterm Exam</b>	
W8: Mar 6-Mar 10	Validity I	Ch. 5
W9: Mar 13-Mar 17	<b>Spring Break (No Class)</b>	
W10: Mar 20-Mar 24	Validity II	Ch. 5
W11: Mar 27-Mar 31 Mar 29 (Wed)	Test Construction; Item Writing *HW 3 assigned	Ch. 6, Handouts
W12: Apr 3-Apr 7 <b>Apr 4 (Tue)</b> Apr 5 (Wed)	Item Analysis <b>*HW 3 due</b> *Final Project assigned	Ch. 6
W13: Apr 10-Apr 14	Item Response Theory I	Ch. 11.5-11.6, Handouts
W14: Apr 17-Apr 21  Apr 19 (Wed)	Item Response Theory II; Criterion-referenced Test vs. Norm-referenced Test *HW 4 assigned	Ch. 11.7-11.9 Ch. 10.5, Handouts
W15: Apr 24-Apr 28 <b>Apr 25 (Tue)</b> <b>Apr 28 (Fri)</b>	Review; Preparation for Final Exam <b>*HW 4 due</b> <b>*Final Report Due</b>	
<b>W16: May 5-6 (Fri-Sat)</b>	<b>Final Exam</b>	