EDMS 738E  
Psychometrics in Large-scale Assessment  
Fall 2017  
EDU1121  
4:15-7:00pm  
Thursday

**Instructor**  
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Email: hjiao@umd.edu

**Course Prerequisites**  
This course is a graduate-level measurement course. The prerequisites of this course include classical and modern measurement theories, especially item response theory (IRT) and statistical models up to regression.

**Course Objectives**  
This seminar focuses on current psychometric practices, issues, and research in large-scale assessment centering on the applications of IRT models and extended IRT models. The first part of the course emphasizes on the current psychometric practices and the issues in large-scale assessments. It covers calibration, item analysis, item/data review, test form assembly, equating, scaling, and vertical scaling. Related to each of the topics, current practices will be reviewed and issues will be identified through discussions. The second part focuses on some special research topics such as fraud detection based on identifying aberrant item responding behaviors, clustering effects in IRT modeling, issues in calibrating innovative items such as paired passages, double-coded items, and multipart items, latent differential item functioning, and models for diagnosis including latent class model based approaches, latent trait model based approaches, and item feature related models such as MIRID model, and LLTM. All these are highlighted and addressed in the latest prevalent use of computer technology in testing including computerized linear test and computerized adaptive test in different large-scale assessment programs to motivate students to come up with technically defensible solutions to improve the current practices in large-scale assessment. It is expected that the overview of the current practices will motivate students to think of the problems and come up with possible innovative solutions, thus initiate original research. Students should read relevant literature before each class so that meaningful discussion will be possible in class. Each class session consists of lectures and discussions. The expected final product of taking this course is to create a proposal for an academic conference in psychometrics such as NCME, AERA Division D, IMPS, or APA, which ultimately leads to a journal publication.

**Office Hours**  
Thursday 1:00-3:00pm  
or by appointment
Textbooks

  - Chapter 4 Item response theory: page 111-153
  - Chapter 5 Scaling and norming: page 155-186
  - Chapter 6 Linking and equating: page 187-220
  - Chapter 7 Test fairness: page 221-257
  - Chapter 9 Test development: page 307-353
  - Chapter 10 Test administration, security, scoring, and reporting: page 355-386
  - Chapter 13 Technology and testing: page 471-515

  - Chapter 1 Twelve steps for effective test development: page 3-26
  - Chapter 14 Innovative item formats in computer-based testing: in pursuit of improved construct representation: page 329-348
  - Chapter 19 Item analysis: page 421-444
  - Chapter 21 Vertical scales: page 469-486

Additional Reference Textbooks


Special Journal Issues:

- *Applied Psychological Measurement* (Fall, 1982), Advances in item response theory and applications. (Special Issue).
- *Applied Psychological Measurement* (Spring, 1995), Polytomous item response theory. (Special Issue)

Other Resources:
Baker’s IRT Book: The Basics of Item Response Theory.
http://edres.org/irt/baker/

CAT: http://www.psych.umn.edu/psylabs/catcentral/

Center of Advanced Studies in Measurement and Assessment at University of Iowa
http://www.education.uiowa.edu/casma/index.html

IRT Modeling Lab at UIUC
http://work.psych.uiuc.edu/irt/tutorial.asp

UMASS
http://www.umass.edu/remp/main_software.html
### Course Topics and Readings

The following table lists the topics to be covered in this course. **This timetable is tentative. Adjustment is very likely to be made along the semester.** Reading materials will be uploaded onto elms and are subject to adjustment.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Assignments</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/31</td>
<td>Course overview&lt;br&gt;Overview of test development</td>
<td></td>
<td>Brennan Ch. 9 page 307-353&lt;br&gt;Downing &amp; Haladyna Ch. 1 page 3-26</td>
</tr>
<tr>
<td>2</td>
<td>9/7</td>
<td>Calibration&lt;br&gt;Calibration sample&lt;br&gt;Estimation methods&lt;br&gt;Software</td>
<td>HW1</td>
<td>Brennan Ch. 4 page 111-118, 122-123, 129-132, 136-143&lt;br&gt;Ericikan et al. (1998)&lt;br&gt;Zhao &amp; Hambleton (2007)</td>
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<tr>
<td>3</td>
<td>9/14</td>
<td>Field-test item calibration&lt;br&gt;Item analysis&lt;br&gt;Item/data review</td>
<td></td>
<td>Downing &amp; Haladyna Ch. 19 page 421-444&lt;br&gt;Brennan Ch. 9 page 329-344&lt;br&gt;Hanson &amp; Béguin (2002)</td>
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<tr>
<td>4</td>
<td>9/21</td>
<td>Test form assembly&lt;br&gt;Anchor &amp; operational form&lt;br&gt;Linear vs. adaptive</td>
<td>HW2 Critique</td>
<td>Brennan Ch. 9 page 331-336&lt;br&gt;Brennan Ch. 13 page 479-481; 488-493&lt;br&gt;MARC conference</td>
</tr>
<tr>
<td>5</td>
<td>9/28</td>
<td>Monte Carlo simulation (self-study)&lt;br&gt;Design &amp; data simulation</td>
<td>HW2 Due</td>
<td>No class (AERA business meeting)&lt;br&gt;Harwell et al. (1996)</td>
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<tr>
<td>6</td>
<td>10/5</td>
<td>Equating &amp; linking&lt;br&gt;Equating methods&lt;br&gt;Anchor item stability check</td>
<td>Critique Due</td>
<td>Brennan Ch. 6 page 187-220&lt;br&gt;Brennan Ch. 4 page 133-136&lt;br&gt;Mislevy (1992)&lt;br&gt;Sinharay &amp; Holland (2007)&lt;br&gt;Stocking &amp; Lord (1983)</td>
</tr>
<tr>
<td>10</td>
<td>11/2</td>
<td>Applications of artificial intelligence in assessment</td>
<td>HW3</td>
<td>MARC conference&lt;br&gt;Brennan Ch. 13 page 471-515</td>
</tr>
</tbody>
</table>
Statistical Software

You can choose R, SAS, and SPSS for data analysis in addition to WINSTEPS, PARSSCALE, and other software programs such as CONQUEST, OpenBUGS, and IRTPRO. Download textpad from http://www.textpad.com/ for your convenience in manipulating item response data.

Formal Course Assessment

Homework Assignments
There will be 4 assignments spaced evenly throughout the semester to give students an opportunity to apply, practice, and think about the concepts learned in class. It is expected that students will be using a variety of software programs for homework assignments. When working on the assignments, students are expected to pull together the material from lecture, chapters, and journal papers where applicable. Homework assignment will be submitted electronically via email in a WORD file attachment and graded homework will be returned via email too. Late homework assignments will be accepted with a penalty of 10% credit. Graded assignments will generally be returned on the following day in class after they are submitted. Students are encouraged to work in groups on homework, but each student must turn in their own write-up.
In the assignments students should cut and paste relevant portions of the computer output into the appropriate places in the homework to show how solutions are arrived. Assignments should be well-organized and must be word-processed.

**Critique**
The student needs to submit a single-spaced 2-5 page critique of a peer-reviewed journal article, technical report, or a book chapter. The reviewed work can focus on methodological or applied issues, but the review must address relevant issues centered on psychometrics in assessment. The critique needs to meet the following criteria:
(a) identify and describe the issues or topics addressed;
(b) explain the significance of the psychometric issues that were explored in this work;
(c) identify strengths and weaknesses of the reviewed work;
(d) provide recommendations for revisions of the work; and
(e) be written effectively for communicating these ideas.

**Projects**
There will be two projects: a midterm CES project and a final research project. For the midterm CES project, you will be given a data set and expected to create a CES report based on your analysis for calibration, equating, and scaling. For the final project, each student will propose an original research study and write up a proposal based on one of the call for proposals for a conference like AERA Division D, NCME, NCME Graduate Student Poster Session, IMPS, or APA including background, literature review, research questions, methodology, and results if available. **Preliminary analysis should be conducted using either simulated data or real data.**

Scoring rubrics for final research proposal:

*Objectives or purposes* **Min: 1:** (Insignificant) **Max: 5:** (Critically Significant)
*Perspective(s) or theoretical framework:* **Min: 1:** (Not Articulated) to **Max: 5:** (Well Articulated)
*Methods, techniques, or modes of inquiry:* **Min: 1:** (Not Well Executed) to **Max: 5:** (Well Executed)
*Data sources, evidence, objects or materials Or, for theory or methods based papers, what would be the equivalent bases:* **Min: 1:** (Inappropriate) to **Max: 5:** (Appropriate)
*Results and/or substantiated conclusions or warrants for arguments/point of view (Not available):** **Min: 1:** (Ungrounded) to **Max: 5:** (Well Grounded)
*Scientific or scholarly significance of the study or work:* **Min: 1:** (Routine) to **Max: 5:** (Highly Original)

**Presentation**
This assessment requires students present on their proposed research for the final project. Each student will be given 10-15 minutes to present his/her study and 3-5 minutes for questions. Each presentation will be rated based on the same evaluation criteria as for the final project. Each student will rate other students’ presentations anonymously and students’ ratings will be counted towards the final score for this assessment. Outlier ratings will be dropped.
**Course Grades**

Students’ homework, exams, and projects’ grades will be combined using a weighted average grading scheme with the corresponding weights given below. Final letter grades will then be assigned based on the given scale.

<table>
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<tr>
<th>Assessment</th>
<th>Weight</th>
<th>Overall Course Percent</th>
<th>Grade</th>
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<tr>
<td>Total homework points</td>
<td>40%</td>
<td>100%-95%</td>
<td>A+</td>
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<tr>
<td>Total midterm project points</td>
<td>20%</td>
<td>94% - 91%</td>
<td>A</td>
</tr>
<tr>
<td>Total critique points</td>
<td>10%</td>
<td>90% - 88%</td>
<td>A-</td>
</tr>
<tr>
<td>Total presentation points</td>
<td>10%</td>
<td>87% - 85%</td>
<td>B+</td>
</tr>
<tr>
<td>Total final project points</td>
<td>20%</td>
<td>84% - 81%</td>
<td>B</td>
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<td></td>
<td></td>
<td>80% - 78%</td>
<td>B-</td>
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<tr>
<td></td>
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<td>77% - 75%</td>
<td>C+</td>
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<td>74% - 70%</td>
<td>C</td>
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<td>69% - 65%</td>
<td>C-</td>
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<td>64% - 60%</td>
<td>D+</td>
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<td>59% - 55%</td>
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<td>54% - 50%</td>
<td>D-</td>
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<td>≤ 49%</td>
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**Class Policies**

**Academic integrity:** The University of Maryland, College Park has a student-administered Honor Code and Honor Pledge. For more information on the Code of Academic Integrity or the Student Honor Council, please visit [http://www.studenthonorcouncil.umd.edu/whatis.html](http://www.studenthonorcouncil.umd.edu/whatis.html). This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. The code prohibits students from cheating, fabrication, facilitating academic dishonesty, and plagiarism. Instances of this include submitting someone else’s work as your own, submitting your own work completed for another class without permission, or failing to properly cite information other than your own (found in journals, books, online, or otherwise). Any form of academic dishonesty will not be tolerated, and any sign of academic dishonesty will be reported to the appropriate University officials.

**Special needs:** If you have a registered disability that will require accommodation, please see the instructor so necessary arrangements can be made. If you have a disability and have not yet registered with the University, please contact Disability Support Services in the Shoemaker Building (301.314.7682, or 301.405.7683 TTD) as soon as possible.

**Religious observances:** The University of Maryland policy on religious observances states that students not be penalized in any way for participation in religious observances. Students shall be allowed, whenever possible, to make up academic assignments that are missed due to such absences. However, the student must contact the instructor before the absence with a written notification of the projected absence, and arrangements will be made for make-up work or examinations.
**Course evaluations:** As a member of our academic community, students have a number of important responsibilities. One of these responsibilities is to submit course evaluations each term through CourseEvalUM in order to help faculty and administrators improve teaching and learning at Maryland. All information submitted to CourseEvalUM is confidential. Campus will notify you when CourseEvalUM is open for you to complete your evaluations for fall semester courses. Please go directly to the website (www.courseevalum.umd.edu) to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

**Missed single class due to illness:** Once during a semester, a student’s self-authored note will be accepted as an excuse for missing a minor scheduled grading event in a single class session if the note documents the date of the illness, acknowledgement from the student that information provided in the note is correct, and a statement that the student understands that providing false information is a violation of the Code of Student Conduct. Students are expected to attempt to inform the instructor of the illness prior to the date of the missed class.*

**Major scheduled grading events:** Major Scheduled Grading Events (MSGE) are indicated on the syllabus. The conditions for accepting a self-signed note do not apply to these events. Written, signed documentation by a health care professional, or other professional in the case of non-medical reasons (see below) of a University-approved excuse for the student’s absence must be supplied. This documentation must include verification of treatment dates and the time period for which the student was unable to meet course requirements. Providers should not include diagnostic information. Without this documentation, opportunities to make up missed assignments or assessments will not be provided.

**Non-consecutive, medically necessitated absences from multiple class sessions:** Students who throughout the semester miss multiple, non-consecutive class sessions due to medical problems must provide written documentation from a health care professional that their attendance on those days was prohibited for medical reasons.

**Non-medical excused absences:** According to University policy, non-medical excused absences for missed assignments or assessments may include illness of a dependent, religious observance, involvement in University activities at the request of University officials, or circumstances that are beyond the control of the student. Students asking for excused absence for any of those reasons must also supply appropriate written documentation of the cause and make every attempt to inform the instructor prior to the date of the missed class.