The College of Education CAREs

The College of Education is dedicated to the ideals of Collaboration, Academic Excellence, Research, and Ethical Practice. These are key tenets in the Conceptual Framework of the College of Education. Competence in these ideals will provide candidates in educator preparation programs with skills, knowledge, and dispositions to be successful in the schools of today and tomorrow. For more information on the Conceptual Framework, visit: www.coedu.usf.edu/main/qualityassurance/ncate_visit_info_materials.html

Course: EDF 7439_901_F07
Course Title: Foundation of Item Response Theory
Course Prerequisites: Stat III/Structural Equation Modeling/Measurement II
Time: Mondays 5:00 p.m. – 7:50 p.m.
Location: EDU 261
Office Hours: Thursdays  2:00 p.m. – 5:00 p.m.
Other times by appointment

Instructor: Yi-Hsin Chen
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Telephone: (813) 974-4964
E-mail: ychen@coedu.usf.edu
Skype Account: yihsin1113

Department Secretary: Lisa Adkins
Office: EDU 360
Telephone: 813-974-3220

Required Texts:

Useful and Readable supplementary Texts:
AERA- Ethical Standards http://www.aera.net/aboutaera?id=173

Special Journal Issues:
Class Materials

Class Materials and practical assignments will be posted on our course’s BlackBoard website @
https://my.usf.edu/

The COE Computer Statistics Lab is in EDU 248. Many IRT-related programs used in this class are available in that lab.

Course Purpose:

The primary purpose of the course is to introduce students to the terminologies, models, and computer programs of item response theory (IRT) and further apply them to educational and psychological test data. The emphasis will be on models and applications most frequently used in social science research, especially in the fields of education and psychology. Computer applications of the models and procedures will be integrated into the course.

Successful completion of course requirements is expected to result in students’ increased ability to (a) comprehend and apply basic IRT models to analyze real sets of data; (b) intelligently read and evaluate research literature; (c) recognize the strengths/limitations of IRT-related analyses in the conduct of disciplined inquiry; (d) communicate with peers and other professionals on IRT-related research issues (e) conduct data analyses and reporting of results in a manner consistent with the ethical guidelines of professional associations such as the American Statistical Association (ASA), American Educational Research Association (AERA), and the American Psychological Association (APA).

Student Outcomes

Students who successfully complete all course requirements will be able to:

1. Become familiar with models of item response theory and understand mathematical underpinning of the models in item response theory.
2. Recognize the fields of applications of diverse IRT models and be able to use computer programs to analyze empirical data.
3. Read and evaluate current literature of item response theory and its applications.
4. Write reports in sufficient detail that other colleagues and researchers are able to understand and interpret them accordingly.
5. Work collaboratively with peers in the conduct of research activities (e.g., literature review, data analyses, interpreting statistical analyses of data, preparation of summary reports).

Course Description:

In the theory part, we will focus on development and difference between classical test theory (CTT) and IRT, and on binary IRT models as well as their application fields. One-parameter logistic (Rasch; 1-PL), two-parameter logistic (2-PL), and Birnbaum’s three-parameter (3-PL) models for dichotomously scored data will be reviewed from a theoretical viewpoint. That is, estimation procedures of item and ability
parameters (item calibration and scaling) behind these models will be presented. Polytomous IRT models for multiple-category types of item-response data will be introduced after Binary IRT models. These models include the grade-response model, the partial credit model, the rating scale model, the nominal response model, and so on.

In the application part, we will focus on several practical fields of applications of IRT models, such as model-data fit, test equating, differential item functioning, test construction, and computerized adaptive testing. These applications will be studies along with using IRT computer programs (e.g., TESTFACT, BILOG-MG, and MULTILOG). We will also cover application in the fields of cognitive assessment and personality and attitude assessment. Finally, attention will be paid on cognitively-diagnostic assessment (CDA), such as Logistic Linear Test Model (LLTM) and Tatsuoka’s Rule-Space Methodology (RSM). RSM will be our target focus.

**Course Expectations:**

Students are expected to attend each class session and to actively participate in class activities. If you know you will not be able to attend a particular class session, please notify me beforehand.

Each student is expected to complete the reading assignments in the textbooks and any supplementary readings given prior to the class session. In addition, students will also be assigned practice exercises that will not be graded, but it is expected that each student will complete the exercise for the next class session.

Students are expected to submit their assignments on time. A specific due date for each assignment will be indicated. Detailed information on each of these assignments will be provided in class.

**Criteria for Evaluation of Student Performance**

Homework, exams, and projects will be assigned to help you learn basic skills and concepts as well as practice computer programs for IRT. For these, you can discuss with your classmates or me. However, please complete the tasks individually. There will be two written assignments, a take-home mid-term examination, and three presentations for project prospectus, literature review, and final report. Outlines for the group project will be distributed in class.

Each student’s final course grade will be computed as a weighted combination of five components as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>a) Attendance &amp; Participation</td>
<td>5%</td>
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<tr>
<td>b) Written Assignments (I &amp; II)</td>
<td>20%</td>
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<tr>
<td>c) Midterm Examination</td>
<td>30%</td>
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<td>d) Group Presentations (I, II, &amp; III)</td>
<td>15%</td>
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<tr>
<td>e) Group Research Project</td>
<td>30%</td>
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**Research Report:** For the **Research Project** students will complete an theoretical or empirical research study, including the application of IRT software and an interpretation of the results. This is small group project, each group will have 3 students, grade points earned will be earned by all members of the small group.
ADA Statement:

Students with disabilities are responsible for registering with the Office of Student Disabilities Services in order to receive special accommodations and services. Please notify the instructor during the first week of classes if a reasonable accommodation for a disability is needed for this course. A letter from the USF Disability Services Office must accompany this request.

USF Policy on Religious Observances:

All students have a right to expect that the University will reasonably accommodate their religious observances, practices and beliefs. Students are expected to notify the instructor in writing by the second class if they intend to be absent for a class or announced examination, in accordance with this policy.

USF NetID Account

An official USF e-mail account is given to each USF student when enrolled. Every official USF correspondence to students will be sent to your USF e-mail account. To sign up for USF NetID account and to access your account go to https://my.usf.edu/

Academic Dishonesty and Plagiarism

“Plagiarism is defined as “literary theft” and consists of the unattributed quotation of the exact words of a published text, or the unattributed borrowing of original ideas by paraphrase from a published text. On written papers for which the student employs information gathered from books, articles, or oral sources, each direct quotation, as well as ideas and facts that are not generally known to the public at large must be attributed to its author by means of the appropriate citation procedure. Citations may be made in footnotes or within the body of the text. Plagiarism also consists of passing off as one’s own, segments or the total of another person’s work.

Punishment for Academic Dishonesty will depend on the seriousness of the offense and may include receipt of an “F” with a numerical value of zero on the item submitted, and the “F” shall be used to determine the final course grade. It is the option of the instructor to assign the student a grade of F or FF (the latter indicating dishonesty) in the course.”
(Source: http://www.sa.usf.edu/handbook/academics/ImportantAcademicPolicies.htm)

Detection of Plagiarism

The University of South Florida has an account with an automated plagiarism detection service which allows instructors and students to submit student assignments to be checked for plagiarism. I reserve the right to 1) request that assignments be submitted as electronic files and 2) electronically submit assignments to SafeAssignment, or 3) ask students to submit their assignments to SafeAssignment through myUSF. Assignments are compared automatically with a database of journal articles, web articles, and previously submitted papers. The instructor receives a report showing exactly how a student’s paper was plagiarized. For more information about SafeAssignment and plagiarism, go to http://www.c21te.usf.edu and then click on Plagiarism Resources. For information about plagiarism in USF’s Undergraduate Catalog, go to http://www.ugs.usf.edu/catalogs/0304/adadap.htm#plagiarism .

For more information on the University’s policy on academic dishonesty and plagiarism go to http://www.sa.usf.edu/handbook/academics/ImportantAcademicPolicies.htm
## Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic(s)</th>
<th>Readings &amp; Assignments</th>
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<tbody>
<tr>
<td>01</td>
<td>8/27</td>
<td>1. Course Introduction</td>
<td>Chaps. 1 &amp; 2 and Embretson1996</td>
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<td>2. Discussion of Project Topics</td>
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<td>02</td>
<td>9/3</td>
<td>LABOR DAY (NO CLASS MEETING)</td>
<td>Chaps. 3</td>
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<td>02</td>
<td>9/10</td>
<td>1. Comparisons between IRT and CTT</td>
<td>Chaps 1, 2, &amp; 3</td>
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<td>2. Concepts and the Mathematical model</td>
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<td>3. Assumptions of IRT</td>
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<td>03</td>
<td>9/17</td>
<td>1. Models for Dichotomous data</td>
<td>Chaps 6 &amp; 4 (65-81)</td>
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<td></td>
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<td>2. Excel Demo</td>
<td>*Distribute assignment01</td>
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<td>04</td>
<td>9/24</td>
<td>1. Evaluation of Unidimensionality (TESTFACT)</td>
<td>Chaps 7 (183-186), (207-208), &amp; 13</td>
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<td>2. Item and Test Information</td>
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<td>3. *Proposal prospectus</td>
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<td>05</td>
<td>10/1</td>
<td>1. Evaluation of Model-data fit</td>
<td>Chaps. 9 &amp; 13</td>
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<td>2. BILOG program for binary data</td>
<td>*Distribute assignment02</td>
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<td>06</td>
<td>10/8</td>
<td>1. Ability Scale</td>
<td>Chaps. 6 &amp; 7</td>
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<td>2. Estimation of ability</td>
<td>*Distribute Take-Home Midterm</td>
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<td>07</td>
<td>10/15</td>
<td>1. Probability theory</td>
<td>Chaps. 8</td>
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<td>2. Item Calibration</td>
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<td>08</td>
<td>10/22</td>
<td>1. Polytomous IRT models</td>
<td>Chaps. 5</td>
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<td>09</td>
<td>10/29</td>
<td>1. Test Score linking (Equating)</td>
<td>Chaps. 10 &amp; 13</td>
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<td>2. Software Practice (BILOG-MG)</td>
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<td>10</td>
<td>11/5</td>
<td>1. Differential Item Functioning (DIF)</td>
<td>Chaps. 10 &amp; 13</td>
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<td>2. Software Practice</td>
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<tr>
<td>11</td>
<td>11/12</td>
<td>1. Test Construction</td>
<td>Chaps. 10 &amp; 13</td>
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<td>2. Computerized Adaptive Testing (CAT)</td>
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<td>3. *Literature Review Presentation</td>
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<td>12</td>
<td>11/19</td>
<td>1. Application in Cognitive Assessment (I)</td>
<td>Chaps 11 &amp; 12</td>
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<td>- Latent Class Analysis</td>
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<td>2. Software Practice (WINMIRA)</td>
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<td>- Rule-Space Methodology</td>
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<td>14</td>
<td>12/03</td>
<td>Project Working Day (Meeting but No Lecture)</td>
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<td>15</td>
<td>12/10</td>
<td>1. Presentations of Research Project</td>
<td>Final Exam Week</td>
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