

**George Mason University**  
**College of Education and Human Development**  
Ph. D. in Education and Human Development

EDRS 828.001 - Modern Measurement: Item Response Theory (3 Credits)  
Spring 2024  
Thursdays 4:30 p.m. - 7:10 p.m. Thompson Hall L014 (Fairfax Campus)

**Faculty**

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**Prerequisite:** B- or higher and satisfactory completion of EDRS 821 or EDRS 827 or equivalent required.

**University Catalog Course Description:** Develops knowledge and skills related to Item Response Theory with application in the context of education, psychology, and related fields.

**Course Overview:** EDRS 828 introduces students to the measurement of latent traits using Item Response Theory (IRT) models. Students require a working knowledge of measurement theory. EDRS 828 provides students with the requisite skills to interpret and critically evaluate IRT models as discussed in educational and psychological measurement journals. EDRS 828 will cover binary and polytomous IRT models. Students will learn through a combination of reading assignments, hands-on experience analyzing IRT models through multiple graphics packages and software.

**Course Delivery Method:** Lectures will be used to present quantitative and factual information. Seminar discussions will occasionally be used to clarify and extend knowledge presented in assigned readings. In-class and out-of-class homework, readings, and exercises will be assigned weekly and used to prepare for discussion. **Questions are encouraged.**

**Learning Objectives:** This course is a one-semester measurement course design to expand students' understanding of organizing, analyzing, and interpreting IRT models, it is expected that you will be able to:

- a) Understand fundamental concepts, principles, and procedures of IRT models;
- b) Analyze and interpret measurement data in an IRT framework, with computer aided applications in educational context;
- c) Synthesize and present the integration of their learning in a research project format;
- d) Read and evaluate scientific articles related to application of IRT models in education, psychology and related fields;
- e) Able to envision ways to pursue their interests in the area of educational assessment and measurement in their studies or career

**Required Materials:**

de Ayala, R. J. (2009). *The theory and practice of item response theory*. The Guilford Press.

**Recommended Resource:**

- American Psychological Association (2009). *Publication manual of the American Psychological Association* (6th ed.). APA.
- Baker, F. B., & Kim, S. (2017). *The basics of item response theory using R*. Springer International.
- Embretson, S. E., & Reise, S. P. (2000). *Item response theory for psychologists*. Lawrence Erlbaum.
- Hambleton, R.K., Swaminathan, H., & Rogers, H.J. (1991). *Fundamentals of item response theory*. Sage. (ISBN: 0803936478)
- Raykov, T., & Marcoulides, G. A. (2011). *Introduction to psychometric theory*. Routledge.

**Anti-Racism Statement**

I affirm that in this class, faculty and students will work together to cultivate a more equitable, inclusive, accessible, and just learning environment for all participants, regardless of racial/ethnic background or other marginalized or minoritized positionalities. We will actively seek ways to:

- Make constant, conscious decisions to interrupt racism, other oppressive forces, and cultivate equity, inclusion, and justice for people of all racial/ethnic backgrounds, and in particular those from Black communities, Indigenous communities, immigrant communities and other communities of Color, who are most likely to bear the direct and indirect costs of systems of White supremacy;
- Interrogate histories of White supremacy and White-dominant culture, and to examine the ways in which these histories have impacted our individual beliefs, our interpersonal relationships, our institutional and structural policies and processes, and our entire society;
- Make a commitment to being responsible for our own relationships to, and actions within, systems of White supremacy; and
- Cultivate a practice of self-awareness and self-reflection that allows us to critically evaluate our own role in upholding White supremacy and identify the ways we can interrupt cycles of racism at the individual, interpersonal, institutional, and structural levels.

**Diversity and Inclusion Statement**

The College of Education and Human Development, an intentionally inclusive community, promotes and maintains an equitable and just work and learning environment. We welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and ability status.

- We value our diverse student body and desire to increase the diversity of our faculty and staff.
- We commit to supporting students, faculty and staff who have been the victims of bias and discrimination.
- We promote continuous learning and improvement to create an environment that values diverse points of view and life experiences.
- We believe that faculty, staff and students play a role in creating an environment that engages diverse points of view.
- We believe that by fostering their willingness to hear and learn from a variety of sources and viewpoints, our students will gain competence in communication, critical thinking and global understanding, and become aware of their biases and how they affect their interactions with others and the world.

## Names and Pronouns Use Statement

If you wish, please share your name and gender pronouns with me and how best to address you in class and via email. I use he/him/his for myself and you may address me as “Dr. Powell” in email and verbally. Additionally, I invite students to approach me before or after class and during office hours. I recognize that a student’s name and pronoun(s) can change during a semester if they are in transition. I encourage students to use the tools Mason provides to change your name and pronouns on Mason records if you so choose: <https://registrar.gmu.edu/updatingchosen-name-pronouns/>

## Course Performance Evaluation:

**Article Presentation (5%):** You will be required to identify an IRT article (substantive and not methodological) within your field (or otherwise) and conduct a five-minute presentation.

**Homework Assignments (15%):** Assignments and exercises will be given throughout the course and will include (a) Questions from readings, (b) Homework Problems, and/or (c) Data Analysis Assignment.

**Article Review (20%):** You will review (as though you were peer reviewing) an empirically-based article related to IRT. Your review should address the nature of the study, literature reviewed, methods (appropriateness), hypotheses, data, and conclusions. Your review will be less than two double spaced pages.

**Mid-term Examination (20%):** You will take a midterm examination to demonstrate understanding and knowledge of course content covered.

**Your Data Project (40%):** This assignment can be done individually or within a small group of **no more than three students**. You will identify your own data to conduct IRT analyses to determine the model that best fits your data. The purpose of this project is to focus and integrate the concepts covered in class. You will submit a document that simulates the Methods and Results sections of a manuscript for publication. You will also present their procedures and findings in class. You are also required to make a presentation of the project (10%). And the final written document will comprise the remaining 30%.

## Other Requirements:

**Class Readings:** The readings for this course come from the required textbook as well as journals and other books which provide insight or examples of the topic. Readings, when possible, will be made available to you for download from the Blackboard course website.

**Class Attendance & Participation:** Students are expected to come to class on time, complete assignments, and participate in class discussions.

## Grading Policies:

Grades will be assigned based on the following:

A+	98-100%	B+	88-89%	C	70-79%
A	93-97%	B	83-87%	F	below 70%
A-	90-92%	B-	80-82%		

Final grades are based in the assessments described above. “Extra credit” is not available.

**Late Assignments:** *As a general rule, late assignments will not be accepted.* If you believe you have EXCEPTIONAL circumstances and wish to negotiate to have extra time to complete course work, you must discuss this with me before the day the assignment is due. (Negotiating means that you will be sacrificing a portion, perhaps substantial, of your grade for extra time).

**Professional Dispositions:** Students are expected to exhibit professional behaviors and dispositions at all times. See <https://cehd.gmu.edu/students/polices-procedures/>

### Course Schedule

Date	Class	Topic	Reading	Due Date
1/18	1	Course Overview Review and Contrasting CTT and IRT		
1/25	2	Basic IRT Concepts, Models and Assumptions	de Ayala Ch. 1	
2/01	3	Model Specification and Characteristics		Article Presentation
2/08	4	Estimation Methods	de Ayala Ch. 3-4	
2/15	5	Estimation Methods	de Ayala Ch. 3-4	
2/22	6	Binary IRT Models	de Ayala 2,5-6	
2/29	7	Polytomous IRT Models	de Ayala 7-9	
3/07		Midterm Break		
3/14	8	<b>Midterm Examination</b>		Mid-Term
3/21	9	R Environment and IRT Packages		
3/28	10	Reliability and IRT		
4/04	11	Linking and Equating	de Ayala Ch. 11	
4/11	12	AERA		
4/18	13	Differential Item Functioning	de Ayala Ch. 12	
4/25	14	Computerized Adaptive Testing and Multidimensional IRT	de Ayala Ch. 10	Article Review
5/02	15	Research Project Presentations		Final Project Paper

Faculty reserves the right to alter the schedule as necessary, with notification to students.

## Core Values Commitment

The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: <http://cehd.gmu.edu/values/>.

## GMU Policies and Resources for Students

### *Policies*

- Students must adhere to the guidelines of the Mason Honor Code (see <https://catalog.gmu.edu/policies/honor-code-system/> ).
- Students must follow the university policy for Responsible Use of Computing (see <https://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.
- Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see <https://ds.gmu.edu/>).
- Students must silence all sound emitting devices during class unless otherwise authorized by the instructor.

### *Campus Resources*

- Support for submission of assignments to VIA should be directed to [viahelp@gmu.edu](mailto:viahelp@gmu.edu) or <https://cehd.gmu.edu/aero/assessments> . Questions or concerns regarding use of Blackboard should be directed to <https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/>.
- For information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>

## **Notice of mandatory reporting of sexual assault, sexual harassment, interpersonal violence, and stalking:**

As a faculty member, I am designated as a “Non-Confidential Employee,” and must report all disclosures of sexual assault, sexual harassment, interpersonal violence, and stalking to Mason’s Title IX Coordinator per [University Policy 1202](#). If you wish to speak with someone confidentially, please contact one of Mason’s confidential resources, such as [Student Support and Advocacy Center](#) (SSAC) at 703-380-1434 or [Counseling and Psychological Services](#) (CAPS) at 703-993-2380. You may also seek assistance or support measures from Mason’s Title IX Coordinator by calling 703-993-8730, or emailing [titleix@gmu.edu](mailto:titleix@gmu.edu).

**For additional information on the College of Education and Human Development, please visit our website <https://cehd.gmu.edu/students/> .**