University of Maryland, College Park
EDMS 623: Applied Measurement: Issues and Practices
Fall 2021
Class Location: EDU (Benjamin Bldg) 1315
Class Meeting Time: Thursday 4:15-7:00pm

Instructor

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Office Hours: Thursday 1:30–3:30pm, or by appointment

Course Description

Measurement of constructs that are not directly observable, such as human cognition, personality, emotional distress, etc., is essential to social science research and practice. A central theme in psychological and educational measurement is to establish technical criteria and statistical models to study the reliability, validity, and fairness of the measurement instruments. Whether the instrument is a state-level end-of-grade test, an aptitude test for admissions (e.g., the Graduate Record Examinations; GRE), a licensure examination (e.g., US Medical Licensing Examination; USMLE), a large-scale educational survey (e.g., National Assessment of Educational Progress; NAEP), a quality of life scale for patients with a chronic disease, or a depression inventory used for clinical diagnosis, similar measurement models and methods can be applied.

EDMS 623 is an introductory course to educational and psychological measurement. Classical test theory, factor analysis, generalizability theory, and item response theory are introduced, as well as the fundamental concepts of reliability and validity. The course also covers operational procedures that are commonly used in the development and evaluation of tests including equating and the detection of item bias within the classical test theory framework.

Prerequisites

The prerequisite of this course is **EDMS 645** or courses with equivalent content coverage. Students should be familiar with correlation analysis and linear regression. Please contact the instructor as soon as possible if you do not think you meet these prerequisites.

Objectives

Students are expected to develop a solid understanding of reliability, validity, and fairness for educational measurement instruments, so as to become capable researchers, informed consumers, and clear communicators of test theory. Students should be able to explain fundamental concepts correctly and apply the corresponding methods to their own research in a constructive manner. Students should be able to effectively interpret the results from analyses of test data, whether for their own work or for evaluating others' work. For statistics/quantitative psychology/advanced quantitative methodology students, an additional objective is to become familiar with the statistical framework of test theory, which lays the groundwork for advanced courses in measurement as well as their own methodological research.

Textbooks

- **Raykov, T., & Marcoulides, G. A. (2011). *Introduction to psychometric theory.* New York: Routledge (available from the UMD library).**
- Revelle, W. (under development). *An introduction to psychometric theory with applications in R.*

Additional reading materials, if there is any, will be posted one week before the lecture.

Course Delivery

The class meets every Thursday from 4:15 to 7:00pm at EDU (Benjamin Bldg) 1315. Course slides and supplemental materials will be made available by 10am every Thursday on the ELMS Canvas system. An automatic email notification will be sent out by ELMS when new materials are posted.

Statistical Software

Students will also need access to a statistical package such as SPSS, SAS, STATA, or R. **Students may use any software they are familiar with to complete the homework assignments; however, the course will focus exclusively on R in the sense that**

1. **example code will only be provided in R;**

2. **R output will appear in exams;**
3. **it may be difficult to answer certain homework questions with other software;**
4. **the instructor and TA will not help with questions related to other software.**

There will not be lab sessions on statistical software; however, annotated R code/output and tutorials will be distributed. R is free and easy to install on your own computer. It is currently maintained by the R Core Development Team. Students can download R at the home page of the R project (http://www.r-project.org). It is a very flexible environment that contains a wide variety of packages that allow students to do numerous mathematical and statistical operations ranging from data simulation to data analysis. If you plan to use other commercial software packages, the student license price can be found on TERPware.

Course Assignment

Homework (40%) There will be **four homework assignments** throughout the semester, **each of which is worth 10% of the final grade** and designed to give the students an opportunity to apply and practice the concepts and techniques learned in class. It is expected that students will be using computer software for their homework. Students are expected to refer to materials from lecture, textbooks, and supplementary notes.

Students are encouraged to work in groups on homework **(maximum of 3 students per group)** and to **turn in a single homework with the names of the group members**. It should be understood that **all members of a group receive the same score** on homework completed together. However, taking turns to complete each homework assignment, while time efficient, is not recommended for learning purposes.

The word-processed homework should conform as closely as possible to **APA-style** presentation of tables, graphics, and references. Students are expected to report statistical results as if it were going into a journal article or a thesis, and include the original software output as an appendix to show how they arrive at the solution. Please **do not just copy and paste all the software output** into the writing without necessary interpretation and formatting. Example write-ups of statistical results will be provided at the beginning of the semester. For the APA style, please refer to online resources such as the Purdue Online Writing Lab.

Please note that **late homework will not be accepted** unless pre-approval is given for exceptional circumstances. You are required to upload a **typed document in pdf format** on the specified due date of each assignment. Graded assignments will typically be returned within a week.

Quizzes (10%) A short quiz will be given at the beginning of each class meeting for the purpose of reviewing content from the previous lecture as well as tracking attendance. **Quizzes will not be graded**. Students get full credit (10%) for this part as long as they turn in **eight quizzes** in total throughout the semester. Otherwise, **1% is taken off for each missing quiz** until reaching the minimum score (2%).

Exams (50%) There will be an **in-class midterm (25% of the final grade)** and an **in-class final exam (25% of the final grade)**. The exams will be **closed book and closed notes**. However, students may prepare and use a **formula sheet (letter-size paper, one page, two sided)**; the formula sheet must be **hand-written**. Students should bring a calculator to the exam, and note that sharing calculators among students is not allowed.You are on your honor to **complete their exams independently**; academic misconduct (cheating, plagiarism, etc.) will be subject to the maximum University penalties.

Extra Credit There could be extra credit questions in homework assignments and exams.

Grading Scheme

Table 1: Grading scheme

Letter grade	Percentage
A+	98.00--100.00%
A	92.00--97.99%
A-	88.00--91.99%
B+	85.00--87.99%
B	82.00--84.99%
B-	**78.00--81.99%**

Letter grade	Percentage
C+	75.00--77.99%
C	72.00--74.99%
C-	68.00--71.99%
D+	65.00--67.99%
D	62.00--64.99%
D-	58.00--61.99%
F	0.00--57.99%

With exceptions of computational error, **grades will not be changed once they are posted**. The **incomplete grade is not an option for poor performance** in the course. Unless the student can provide very compelling reasons with proof documents, incomplete will not be given.

Tentative Schedule

Table 2: Tentative schedule (subject to change)

Week	Date	Topic	Assignment posting	Assignment due
1	9/2	Welcome; review; introduction to R	HW1	
2	9/9	Regression; scaling and test development		
3	9/16	Item analysis		HW1
4	9/23	Classical test theory	HW2	
5	9/30	Reliability		
6	10/7	Validity		HW2
7	**10/14**	**Midterm exam**		
8	10/21	Generalizability theory		
9	10/28	Factor analysis I	HW3	
10	11/4	Factor analysis II		
11	11/11	Item response theory I		HW3
12	11/18	Item response theory II	HW4	
13	**11/25**	**Thanksgiving week, no class**		
14	12/2	Test equating; differential item functioning		HW4
15	**12/9**	**Final exam**		

Course Procedures and Policies

Please visit https://gradschool.umd.edu/course-related-policies for a summary of course-related policies. See below for several points to emphasize.

Masking Requirement University policy requires that **masks be worn over the nose and mouth while indoors at all times, regardless of vaccination status**. There are no exceptions. Students not wearing a mask will be given a warning and asked to wear one, or will be asked to leave the classroom immediately. Students who have additional issues with the mask expectation after a first warning will be referred to the Office of Student Conduct for failure to comply with a directive of University officials.

Accommodations for emergency and email communication All students are expected to submit assignments and exams on the specified dates. You must contact the instructor ahead of time if re-scheduling is needed or delays are expected; otherwise, not being able to submit the assignment in time will result in a zero score for that assessment. The primary communication tool will be email in cases of emergency. Emergency deserves prompt replies, but last minute questions with respect to assignments might not be well taken. I strongly recommend that you should plan ahead to meet the deadlines properly.

Accessibility and Disability Services The University of Maryland is committed to creating and maintaining a welcoming and inclusive educational, working, and living environment for people of all abilities. The University of Maryland is also committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of the University, or be subjected to discrimination. The Accessibility & Disability Service (ADS) provides reasonable accommodations to qualified individuals to provide equal access to services, programs and activities. ADS cannot assist retroactively, so it is generally best to request accommodations several weeks before the semester begins or as soon as a disability becomes known. Any student who needs accommodations should contact me as soon as possible so that I have sufficient time to make arrangements. For assistance in obtaining an accommodation, contact Accessibility and Disability Service at 301-314-7682, or email them at adsfrontdesk@umd.edu. Information about sharing your accommodations with instructors, note taking assistance and more is available from the Counseling Center.

Academic integrity The University of Maryland, College Park, has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible to uphold these standards for this course. It is imperative that you are aware of the consequences of **cheating, fabrication, facilitation, and plagiarism**. For more information on the code of Academic Integrity or the Student Honor Council, please see http://www.president.umd.edu/policies/docs/III-100A.pdf. Plagiarism and other forms of academic fraud are a violation of university regulations and unacceptable under any circumstance. These instances have to be and will be reported to the Honor Council in writing. Notes on plagiarism in this class:

Due to the nature of reporting statistical results, some expressions are commonly used and should be phrased in the same/similar ways. However, how to approach a problem and end up with the solution is definitely a result of logic process, and this should not be stolen and used with proper citations.

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, they 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.

Student Resources and Services Taking personal responsibility for your own learning means acknowledging when your performance does not match your goals and doing something about it. I hope you will come talk to me so that I can help you find the right approach to success in this course, and I encourage you to visit UMD's Student Academic Support Services website to learn more about the wide range of campus resources available to you. In particular, everyone can use some help sharpening their communication skills (and improving their grade) by visiting UMD's Writing Center and schedule an appointment with the campus Writing Center. You should also know there are a wide range of resources to support you with whatever you might need (UMD's Student Resources and Services website may help). If you feel it would be helpful to have someone to talk to, visit UMD's Counseling Center or one of the many other mental health resources on campus.

Basic Needs Security If you have difficulty affording groceries or accessing sufficient food to eat every day, or lack a safe and stable place to live, please visit UMD's Division of Student Affairs website for information about resources the campus offers you and let me know if I can help in any way.

Participation The classes will be composed of lectures and small group/class discussions. Each student's meaningful participation is very appreciated and will contribute to the entire learning process, promoting critical thinking skills. Throwing questions and bringing in topic-related problems to class are always welcomed.

Course Evaluation Please submit a course evaluation 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 Course Eval UM website to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing through Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.