



---

WESTERN MICHIGAN UNIVERSITY

---

**Department of Educational Leadership,  
Research, & Technology**

**Graduate Programs in Evaluation, Measurement,  
and Research**

**EMR 6410  
Fundamentals of Measurement  
in the Behavioral Sciences  
Fall 2017**

**Course Pack and Syllabus**

<b>COURSE CATALOGUE DESCRIPTION .....</b>	<b>3</b>
<b>COURSE DETAILS .....</b>	<b>3</b>
PREREQUISITE.....	3
CREDIT AND CLOCK HOURS.....	3
INSTRUCTOR.....	3
WMU ELEARNING WEB SITE PORTAL .....	3
TECHNICAL SUPPORT .....	3
OFFICE HOURS.....	4
REQUIRED TEXTS.....	4
<b>INSTRUCTIONAL OBJECTIVES .....</b>	<b>4</b>
<b>PROFESSIONAL CONCERNS .....</b>	<b>4</b>
NEED FOR ACCOMMODATIONS.....	5
DIVERSITY STATEMENT.....	5
PLAGIARISM AND ACADEMIC HONESTY .....	6
<b>EVALUATION POLICY .....</b>	<b>6</b>
METHODS OF EVALUATION .....	7
ATTENDANCE AND PARTICIPATION IN CLASS .....	7
COURSE GRADING SCALE .....	7
<b>DROP BOX .....</b>	<b>7</b>
<b>HOMEWORK POLICY .....</b>	<b>8</b>
<b>HOMEWORK DESCRIPTIONS.....</b>	<b>8</b>
<b>WEEKLY TOPIC LIST.....</b>	<b>9</b>
<b>SELECTED BIBLIOGRAPHY .....</b>	<b>10</b>

## Course Catalogue Description

The criteria by which instruments are selected and developed serve as the central focus of this course. Information regarding the theory and practice of measurement and testing are applied across educational, social, and behavioral settings. Students are expected critically to evaluate instrumentation as well as to develop a plan for the creation of an instrument.

### Course Details

#### **Prerequisite**

Successful completion of EMR 6400 *Introduction to EMR* and (or concurrent enrollment in) EMR 6450 *Elementary Statistics* or equivalents as approved by instructor.

#### **Credit and Clock Hours**

3 Semester hours

Monday 6:00 to 8:45 PM

Classroom: 2330 Sangren Hall

#### **Instructor**

Brooks Applegate, Ph.D.

Educational Leadership, Research & Technology

3571 Sangren Hall

V: 269-387-3886

F: 269-387-3696

[brooks.applegate@wmich.edu](mailto:brooks.applegate@wmich.edu)

Skype ID: brooks.applegate

#### **WMU eLearning Web Site Portal**

<https://elearning.wmich.edu>

#### **Technical Support**

Western Michigan University Office of Instructional Technology:

Helpdesk; <http://www.wmich.edu/oit/helpdesk/index.html>

Hours: 8am-10pm (Monday-Friday, EST)

Phone **(269) 387-HELP (387-4357)**

Email: [HELPDESK@WMICH.EDU](mailto:HELPDESK@WMICH.EDU)

## **Office Hours**

Monday 1:00 – 2:30 pm and by appointment

Please make an email request to me for private conversations either by phone or live chat if office hours are not convenient for you to make. Alternatively, the eLearning discussion board should be used and if you think your question(s) have a wider appeal; such as course content clarification please use the so that all students can benefit from the discussions and clarifications.

## **Required Texts**

American Educational Research Association, American Psychological Association, and National Council on Measurement in Education (2014). *Standards for Educational and Psychological Testing*. Washington, DC: Author.

Crocker, L. & Algina, J. (1986). *Introduction to classical & modern test theory*. New York: Holt, Rinehard and Winston.

*Publication manual of the American Psychological Association*, (6th ed.) (2014). New York: Author.

## **Instructional Objectives**

The student will be able to:

1. Identify and differentiate among different forms of reliability evidence appropriate for different test/assessment purposes.
2. Identify and differentiate among different forms of validity evidence appropriate for different test/assessment purposes.
3. Select appropriate methods for estimating the reliability and validity of an assessment for a particular use (NRT and CRT).
4. Differentiate CTT and IRT.
5. Describe 1, 2, 3 parameter IRT models.
6. Describe how Generalizability Theory extends CTT treatment and estimation of reliability.

To accomplish the above, students will be able to:

1. Program and interpret various methods for estimating scale reliability based on the CTT model.
2. Program and interpret item analysis based on CTT and IRT {1,2,3 parameter models}
3. Differentiate the reliability and validity needs for NRT and CRT

## **Professional Concerns**

You are responsible for making yourself aware of and understanding the University policies and procedures that pertain to Academic Honesty. These policies include

cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. The academic policies addressing Student Rights and Responsibilities can be found in the Graduate Catalog at <http://catalog.wmich.edu/content.php?catoid=25&navoid=1030>. If there is reason to believe you have been involved in academic dishonesty, **you will be** referred to the Office of Student Conduct and receive no point credit for the exercise or assignment. If you are referred to the Office of Student Conduct for more than one occurrence of a charge of academic dishonesty and are found responsible, you will automatically fail the course. You will be given the opportunity to review the charge(s) and if you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

WMU aspires to be a community of academics and professionals who value the diverse perspectives and experiences each individual brings to the university community. These differences contribute to a rich and vibrant academic environment which strives to broaden our understanding of complex issues and gain new insights of the world. Although our perspectives, ideas and opinions may vary, each person is valued and treated respectfully. Several University policies speak to this goal: 1) prohibited sexual misconduct under Title IX, the Clery Act and the Violence Against Women Act (VAWA) and Campus Safe the *Sexual and Gender-Based Harassment and Violence, Intimate Partner Violence, and Stalking Policy* can be found at [www.wmich.edu/sexualmisconduct](http://www.wmich.edu/sexualmisconduct); 2) the *Faculty Senate Religious Observances Policy* (MOA-07/02) was passed by the Senate in May, 2007 and approved by the provost and president in June, 2007 can be found at [http://www.wmich.edu/facultysenate/downloads/MOA0702\\_religious\\_observances\\_final.pdf](http://www.wmich.edu/facultysenate/downloads/MOA0702_religious_observances_final.pdf). The Interfaith Calendar available at [www.interfaithcalendar.org](http://www.interfaithcalendar.org) is a helpful resource for identifying religious observance dates.; and 3) The Faculty Senate, provost and president approved an aspirational *Civility Statement* in May, 2016 which can be found at [http://wmich.edu/sites/default/files/attachments/u370/2016/Civility%20Stmt.7-27-16\\_0.pdf](http://wmich.edu/sites/default/files/attachments/u370/2016/Civility%20Stmt.7-27-16_0.pdf).

### ***Need for Accommodations***

Any student with a documented disability (e.g., physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the professor and the Disability Services for Students office at [www.wmich.edu/disabilityservices](http://www.wmich.edu/disabilityservices)

### ***Diversity Statement***

The University and Department of Educational Leadership, Research & Technology

(ELRT) EMR program maintains a strong and sustained commitment to the diverse and unique nature of all learners and high expectations for each student. A general resource for Diversity can be found at Division of Student Affairs at [www.wmich.edu/students/diversity](http://www.wmich.edu/students/diversity).

### ***Plagiarism and Academic Honesty***

Students who take this class must be prepared to submit electronic copies of some or all assignments. The University expects that all students will be evaluated and graded on their own work. If you use language, data, or ideas from other sources, published or unpublished, you must take care to acknowledge and properly cite those sources. Failure to do so may constitute plagiarism or other violation of University academic honesty policies, see above reference to the university academic policy. To detect and deter plagiarism, encourage responsible student behavior, improve student learning, and ensure greater accountability, assignments for this class may be submitted for textual similarity review to Turnitin.com and/or other resource. Use of the Turnitin.com service is subject to the Terms and Conditions of Use posted on the Turnitin.com website.

Papers that are submitted to Turnitin.com become part of the Turnitin.com database (student identities are protected) solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Terms and Conditions of Use posted on the Turnitin.com site. Students agree that by taking this course all required papers maybe subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Terms and Conditions of Use posted on the Turnitin.com site. The results of a Turnitin.com originality report or other resources may be used as evidence to charge you with plagiarism or other offense. If that is the case, you will be you will be referred to the Office of Student Conduct.

If you wish to request that your paper(s) not be included in the Turnitin.com reference database, I need to receive your request in writing prior to submission of any course assignments; the paper(s) can then be processed and reviewed accordingly.

### **Evaluation Policy**

Course grades are based on total points from homework assignments and exams, including extra credit homework and exam problems. However, regardless of total points, no student who fails the final examination (if administered) will receive an "A" grade in the course. Professionalism in all course-related endeavors and active class

participation is expected. All work will be evaluated based on accuracy, adherence to guidelines and due dates, thoroughness, evidence of effort, evidence of professionalism, evidence of data integration, coherence, and appearance. Be sure to check, proof, and edit all work submitted.

### ***Methods of Evaluation***

In order to benefit most from your study of this course material, you are expected to read the course text, all related documents, journal articles, complete assignments related to course topics, and document mastery of course content through a midterm and final exam. Timely completion and the quality of your work will contribute to your overall course grade. In fairness to all, a penalty will be imposed for any work submitted late. Generally speaking, the penalty will be equivalent to one letter grade or more. Extenuating circumstances will be considered with proper documentation.

### ***Attendance and Participation in Class***

Regular and punctual class attendance is expected of all students. A student may be dropped from a course and assigned a failing grade for excessive absences. Excessive absence is attending less than 80% of scheduled class meetings (F2F or otherwise, e.g. lab). One absence will be accepted without affecting a participation grade if a relevant excuse is provided. If you have to be absent, please make arrangements to get materials/notes from a classmate or instructor. Regardless of the reason, you cannot receive credit for participation if you are not present to participate. Be prepared to discuss problems and readings as a class or in cooperative groups. If you have questions, you may ask them in class, or via email, as it is your responsibility to gain clarification. You may need to do supplementary reading for this class to make up for deficient and weaknesses in your background knowledge.

### ***Course Grading Scale***

100 – 95%	A	94 – 90%	BA	89 – 85 %	B
80 – 84 %	CB	79 – 75 %	C	Below 75 %	E

### **Drop Box**

Students are required to submit certain assignments to the Drop Box via the on-line course web site (WMU eLearning) in Microsoft Word file format only (\*.doc or \*.docx) **do not** upload a PDF file. If you are unable to meet this requirement, please inform the instructor immediately. The Word attachment requirement allows for easy handling from the course instructor back to the students (with feedback included within the attached document).

Save your homework as a Word file so that all assignments can be identified by the attachment name who dropped the assignment and which assignment was dropped:

For example, John Doe - Assignment #3 would be saved as **DoeHMK3.docx**. Please do not e-mail the instructor to check on the status of an assignment placed in the digital drop box. If you need verification that I received your email simply CC yourself, if you got it, then so did I. Failure to follow these directions may result in a misplaced assignment, lower grade and untimely feedback.

## **Homework Policy**

Homework assignments are due at 6:00 PM Eastern time (EST or EDT) on the due date posted but will be accepted after the posted date. Assignments uploaded after the posted due date may not receive 100% of the available points at the discretion of the instructor unless prior arrangements are made. If homework is uploaded after the assignment has been graded, returned, or the solution posted, no points will be awarded. Homework re-do's after grading are not accepted. If multiple documents are uploaded to the Drop Box, I will evaluate the document with the most current upload date regardless of the assignment due date, even though this may incur a late penalty.

All homework write-ups (as specified in each assignment) are to conform to the APA style (12pt font), including tables and figures. Failure to comply with the APA formatting requirement will result in progressively severe point deductions. Unless explicitly stated in the assignment directions, output needs to be reformatted into appropriate APA tables and figures. Program scripts if part of the assignment (e.g., SAS, R, Minitab, SPSS, specialized software) **MUST** be included at the end of the document (**do not** upload your program script as a separate file); program output is not necessary.

Extra credit homework opportunities are offered throughout the semester.

## **Homework Descriptions**

### **EMAIL (2 pts EC)**

Due 9/15/17

Post an introduction of you to the course eLearning web site Intro Blog. Tell your classmates, and me something about yourself and why you are taking this class. I'd also like to know what experiences you have had related to constructing any measuring instrument, e.g., classroom test, survey questionnaires.

### **Project #1            Scale Choices and Item & Composite Variance**

Due 10/2/17

Posted to the web are detailed directions for this project.



## **Project #2            Test Reliability**

Due Part A: 10/16/17

Part B: 10/23/17

Part C: 10/30/17

Posted to the web are detailed directions for this project.

## **Project #3            Item/Test Analysis (CTT & IRT)**

Due 11/20/15

Posted to the web are detailed directions for this project.

## **Project #4            Assessment/Test Review & Critique**

Due 12/11/17

Posted to the web are detailed directions for this project.

### **Weekly Topic List**

<u>Week</u>	<u>Reading</u>	<u>Topic</u>
1: 9/11/17	C&A 1&3	Need for Test Theory & Measurement
2: 9/18/17	C&A 2&19	Basic Statistics & Norms & Std Scores
3: 9/25/17	C&A 4	Test Construction
4: 10/2/17	C&A 5&17	Score Composites & Scoring Methods
5: 10/9/17	C&A 6	CTT: Reliability & SEM
6: 10/16/17	C&A 7	CTT: Reliability Estimation Methods
7: 10/23/17	C&A 8	Generalizability Theory <b>In Class Midterm (Ch 1-7, 17, 19)</b>
8: 10/30/17	C&A 9	Criterion-referenced Tests
9: 11/6/17	C&A 10&11	Validity & Prediction & Classification
10: 11/13/17	C&A 13	TBA or Factor Analysis
	<b>AEA in Washington DC, 11/6/17 - 11/11/17</b>	
11: 11/20/17	C&A 14	Item Analysis
12: 11/27/17	C&A 15	Item Response Theory
13: 12/4/17	C&A 12,16,20	Group Difference Testing (Bias) & Equating
14: 12/11/17		<b>In Class Final Exam 6:00-8:00 PM (Comprehensive)</b>

## Selected Bibliography

- Bollen, K. A., & Long, J. S. (1993). Testing structural equation models. California: Sage Publications, Inc.
- Campbell, D. T., & Stanley, J. C. (1966). Experimental and quasi-experimental designs for research. Chicago: Rand McNally & Company.
- Cohen, J., & Cohen, P. (1983). Applied multiple regression/correlation analysis for the behavioral sciences (2<sup>nd</sup> ed.). New Jersey: Lawrence Erlbaum Associates, Publishers.
- Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2<sup>nd</sup> ed.). New Jersey: Lawrence Erlbaum Associates, Publishers.
- Draper, N.R. & Smith, H. (1998). Applied Regression Analysis (3<sup>rd</sup> ed.). New York: Wiley-Interscience.
- Fisher, L. D., & Van Belle, G. (1993). Biostatistics: A methodology for the health sciences. New York: John Wiley & Sons, Inc.
- Hays, W. L. (1988). Statistics (4<sup>th</sup> Ed.). New York: Holt, Rinehart and Winston, Inc.
- Kerlinger, F. N. (1986). Foundations of behavioral research (3<sup>rd</sup> ed.). New York: Holt, Rinehart and Winston.
- Kirk, R. E. (1995). Experimental design: Procedures for the behavioral sciences. California: Brooks/Cole Publishing Company.
- Loehlin, J. C. (1987). Latent variable models: An introduction to factor, path, and structural analysis. New Jersey: Lawrence Erlbaum Associates, Publishers.
- Montgomery, D. C. (1991). Design and analysis of experiments (3<sup>rd</sup> ed.). New York: John Wiley & Sons.
- Scheaffer, R., Mendenhall, W., & Ott, L. (1979). Elementary Survey Sampling (2<sup>nd</sup> ed.). Massachusetts: Duxbury Press.
- Siegel, S. (1956). Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Company.
- Stevens, J. (1986). Applied multivariate statistics for the social sciences. New Jersey: Lawrence Erlbaum Associates, Publishers.
- Winer, B. J. (1971). Statistical principles in experimental design (2<sup>nd</sup> ed.). New York: McGraw-Hill Book Company.