BLOOMSBURG UNIVERSITY
Department of Psychology
Course Syllabus

Course: Advanced Experimental Design **Instructor:** Jeffrey D. Leitzel, Ph.D.
Catalog # Psych 464.01 (3231) **Phone:** (office) 570-389-4232 (mobile) 570-650-6286 (fax) 389-2019
Fall 2019 **Best way to contact is via e-mail:** jleitzel@bloomu.edu
Home page: WWW.LEITZEL.COM **Class Schedule:** M W 4:30 – 5:45 pm
Office: McCormick 2116 **Office hours:** M W 5:45-7:15 pm, Th 3-5 pm

Course Description: Presents an advanced consideration of the planning, conduct and evaluation of research in the behavioral and biological sciences. Emphasizes inferential statistics, design, analysis, interpretation, reporting, and computer utilization. This course will provide overviews and worked examples of multiple regression, path analysis, and factor analysis before concluding with full structural equation models. Students will learn how to interpret results from these models and be critical consumers of multivariate research literature. Lecture, class discussions, problem solving, videos, use of Stata software, homework assignments, exams, and student presentations and papers may all be used to meet the instructional goals. Prerequisites: 48.101, 48.160, 48.281, 48.282 and/or consent of the instructor

Learning Objectives
Upon successful completion of this course, students will be able to:
1. Present and describe data appropriately using descriptive statistics, graphical representations, and/or frequency tables.
2. Apply terminology, concepts, theories, and research on the various types of statistical tests and the appropriate data to which they may be used.
3. Use statistical software and spreadsheet packages appropriately to carry out data analysis and presentation tasks.
4. Create accurate and correctly formatted presentations of statistical tests and their interpretation in APA format.

Students will demonstrate their attainment of these learning objectives during class discussions, by completing data analysis assignments, by working through problems during class, completing homework, in presentations and on exams. If you are not prepared to spend **at a minimum, 6-9 hours per week** outside of class working on this material you should not be taking this course.

Required Texts
Acock, A. C. (2013). *Discovering Structural Equation Modeling Using Stata* (Revised ed.). College Station, TX: Stata Press. Denoted "A" in reading list.
American Psychological Association. (2010). *Publication Manual of the American Psychological Association* (6th ed.). Washington, DC: Author.
Garson, G. D. (2013). Factor Analysis. Asheboro, NC: Statistical Associates Publishers. Denoted "G-FA" in reading list.
Garson, G. D. (2012). Path Analysis. Asheboro, NC: Statistical Associates Publishers. Denoted "G-PA" in reading list.
Kachigan, S. K. (1991). Multivariate Statistical Analysis: A Conceptual Introduction (2nd ed.). New York: Radius Press. Denoted "K-Reg" in reading list.

Stata 15 manuals all: Stata Corp. (2017) … Stata Press: College Station, TX (available online as pdfs)
1. Getting Started with Stata – "S(GS)" in reading list
2. Stata Users Guide – "S(UG)" in reading list
3. Stata Base Reference Manual – "S(R)" in reading list
4. Stata Structural Equation Modeling Reference Manual – "S(SEM)" in reading list

Recommended Texts (Strongly recommended)
Acock, A. C. (2016). *A Gentle Introduction to Stata* (5th ed.). College Station, TX: Stata Press.

Attendance (and participation)
Attendance is required for all class meetings. It will be important for your understanding of the material as well as your engagement in discussion and problem solving with other students and the instructor. A tenth of your total grade consists of attendance and participation. You may miss two classes without any penalty (though I do not recommend missing even two), each class beyond that will result in a 0.5 deduction from

your participation/attendance grade. I also keep track of participation in class and sitting silently in class throughout the semester will result in a minimal grade in this area.

Evaluation/grading (all assignments must be completed in order to receive a passing grade)

Class participation **and** attendance:	10 points	Exam 1:	10 points
Analysis assignments (4 @ 10 ea, lowest grade dropped):	30 points	Exam 2:	15 points
Article presentation:	15 points	Final Exam:	20 points

Grade Ranges

A = 90-100 B = 80-89.99 C = 70-79.99 D = 60-69.99 F = <60

Tentative course schedule (subject to change, any changes will be discussed in class) all dates are "week of":

Date	*Topic(s)*	*Reading(s)*
8-26	Introductions, review syllabus, discuss structure of course, pretest, first look at Stata.	
9-2	**No class on 9-2 Happy Labor Day!** Review of correlation/linear regression/introduction to Stata	Correlation/regression A.S. (your applied statistics text/materials) S(GS)
9-9	Multiple regression – theory/diagnostics	(nontechnical regression overview) and K-Reg
9-16	Multiple regression – continued	
9-23	**Exam #1**	
9-30	Path analysis	G-PA
10-7	Path analysis (cont.) Exploratory factor analysis/Principal components analysis	A (Ch. 1 & 2) G-FA
10-14	EFA/PCA continued	
10-21	**Exam #2**	
10-28	Confirmatory factor analysis	
11-4	CFA (cont.) Structural equation models (SEMs)	
11-11	SEM model fit and modification	
11-18	SEM interpretation and reporting	
11-25	Student presentations **No class on 11-27 Happy Thanksgiving**	
12-2	Student presentations/Course evaluations	

Final Exam: Tuesday, December 10, 3:30-5:30 pm

Exams

There will be three exams during the course of the semester including a comprehensive final exam. **If you miss an exam for any reason it is your responsibility to contact me to arrange for a make up prior to the next scheduled class meeting, failure to do so will result in a zero for that exam.** The problem-solving portion of the exams will be open book/open notes, the theoretical, "knowledge assessment" portion of the exams will be completed without book/notes.

Homework/Assignment problems

When using Stata it is very important that I am able to tell exactly what command you issued to the software. Whenever you are working in Stata, be sure to use Stata's log files to save all of your output and commands you run to perform the analyses. Since for many of the problems in the assignments you will be free to select from a number of possible variables to use, it is vital that I be able to reproduce the analyses you ran.

Some tips on how to do well in this class

1. Spend plenty of time working with Stata. Just reading the manuals does not help much, you must read them while working with the software.
2. Do all assigned reading and problems/examples in the reading.
3. Do additional problems if you're not obtaining the correct answers.
4. Utilize the online tutorials related to both Stata in general and the statistical techniques we will be using in particular.

5. Come and see me during my office hours for help with problems if 1, 2, 3 & 4 above have left you confused. When you come to see me for help, be prepared to show me the work you have done on problems and to discuss specifically what it is that you don't understand.
6. Attend class and participate. It is essential if you hope to do well in the course. You are responsible for all information presented in class whether you are present or not.
7. Do the assigned readings prior to class and come prepared to ask and answer questions about the material. This process will help you clarify any points you do not understand, as well as integrating the ideas and concepts you do understand. Active involvement facilitates learning.
8. Study and review problems with other students. Helping others to understand something is an excellent way of increasing our own mastery. Having others to ask about stuff you don't understand can also be a big help.
9. If there are things that you are just not getting despite reading the chapters, working through the problems, attending class and reviewing your notes, please set up an appointment with me or come see me during office hours.

Further Reading/References

Bollen, K. A. (1989). *Structural Equations with Latent Variables.* New York: John Wiley and Sons.
Bollen, K. A., & Long, J. S. (1993). *Testing Structural Equation Models.* Newbury Park, CA: Sage.
Brown, T. A. (2006). *Confirmatory Factor Analysis for Applied Research.* New York: Guilford.
Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences.* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
Cohen, J., & Cohen, P. (1983). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences.* Hillsdale, NJ: Lawrence Erlbaum.
Gorsuch, R. L. (1983). *Factor Analysis.* Hillsdale, NJ: Lawrence Erlbaum Associates.
Grimm, L. G., & Yarnold, P. R. (Eds.). (1995). *Reading and Understanding Multivariate Statistics.* Washington, DC: American Psychological Association.
Grimm, L. G., & Yarnold, P. R. (Eds.). (2000). *Reading and Understanding MORE Multivariate Statistics.* Washington, DC: American Psychological Association.
Hayduk, L. A. (1987). *Structural Equation Modeling with LISREL: Essentials and Advances.* Baltimore, MD: Johns Hopkins University PRess.
Hayduk, L. A. (1996). *LISREL Issues, Debates, and Strategies.* Baltimore, MD: Johns Hopkins University Press.
Hoyle, R. H. (2012). *Handbook of Structural Equation Modeling.* New York: Guilford Press.
Hoyle, R. H., & Panter, A. T. (1995). *Structural Equation Modeling: Concepts, Issues, and Applications.* Thousand Oaks, CA: Sage.
Marcoulides, G. A., & Schumacker, R. E. (1996). *Advanced Structural Equation Modeling: Issues and Techniques.* Mahwah, NJ: Lawrence Erlbaum Associates.
Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory.* (3rd ed.). New York: McGraw Hill.
Kaplan, D. (2009). *Structural Equation Modeling* (2nd ed. Advanced Quantitative Techniques in the Social Sciences Series Vol. 10). Thousand Oaks, CA: Sage.
Kline, R. B. (2016). *Principles and Practice of Structural Equation Modeling.* (4th ed.). New York: Guilford Press.
Pedhazur, E. J. (1997). *Multiple Regression in Behavioral Research: Explanation and Prediction.* (3rd ed.). New York: Harcourt Brace College Publishers.
Schumacker, R. E., & Lomax, R. G. (2010). *A Beginner's Guide to Structural Equation Modeling.* (3rd ed.). New York: Routledge.
Stevens, J. (1996). *Applied Multivariate Statistics for the Social Sciences.* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
Tabachnick, B. G., & Fidell, L. S. (2018). Using Multivariate Statistics (7th ed.). New York: Pearson.
Westland, J. C. (2012). *Modern Path Analysis & Structural Equation Models.* Chicago, IL: CreateSpace Independent Publishing Platform.