

Syllabus for MAR6930: Experimental Design and Analysis

Instructor:

Dr. Alan Cooke
Phone: 273-3282
Office: Stuzin 267B
Office Hours: Tuesdays 2 – 4 PM and by appointment
E-mail: alan.cooke@warrington.ufl.edu

Class Meetings:

Tuesdays, 1:55 – 4:55 PM
267G Stuzin

Prerequisites:

Instructor consent.

Class Website:

Available through Canvas e-Learning.

Overview:

This class introduces students to analytic methods for behavioral research. It concerns the design, collection, and analysis of behavioral research. The focus is on developing skills applicable to experimental research in marketing, consumer behavior, and related fields. We will examine the proper analysis for a given experimental design and set of assumptions. We will use these analyses to extract lessons regarding good experimental design for causal theory testing. Topics will include one-way and factorial designs, repeated-measures designs, mixed designs, fractional factorial designs, and designs having covariates. You will learn both computational and software-based analytic methods, although the class is intended to be agnostic with respect to the specific analytic software used.

Class Goals:

- Learn how to analyze and interpret experimental data.
- Develop proficiency with analytic software.
- Learn how to design behavioral experiments with maximal internal validity and statistical power.

Required Course Materials:

This class has one required text:

Keppel, Geoffrey and Thomas D. Wickens (2004), *Design and Analysis: A Researcher's Handbook*, (4th ed.), Upper Saddle River, NJ: Prentice-Hall.

Depending on your specific statistical software preferences, you may also want to pick up one of more of the following texts:

1. Page, M. C., Braver, S. L., & MacKinnon, D. P. (2003). *Levine's Guide to SPSS for Analysis of Variance* (Second Edition). Hillsdale, NJ: Lawrence Erlbaum.
2. Cody, R. P. & Smith, J. K. (2005). *Applied Statistics and the SAS Programming Language* (Fifth Edition). Upper Saddle River, NJ: Prentice Hall.
3. Lawson, J. (2010). *Design and Analysis of Experiments with SAS*. Boca Raton, FL: Chapman & Hall/CRC.
4. Lawson, J. (2015). *Design and Analysis of Experiments with R*. Boca Raton, FL: Chapman & Hall/CRC.

Software:

It is of considerable practical importance that you learn to use computer software to perform your data analyses. That said, I do not personally care what software you use, as long as you understand how to get it to do the required analyses and how to interpret the results it provides. My intention is to teach this class in as software-agnostic a way as possible. This means that for questions requiring software, you can complete the questions using your choice of either SPSS, SAS, or R. (In fact, as much as your time allows, you are encouraged to complete these questions using multiple, different software packages, so that you may more fully understand the pros and cons of each. But you should only submit one set of answers to the software-based questions.) I anticipate that in practical terms, this means that students will use SPSS for much of the class and SAS or R in specific situations, but we shall see. Regardless, this is not intended as a software class, and I will not invest valuable class time debugging individual students' code. I will try to illustrate typical analyses using different packages, but if you choose to go "off-trail," you will need to determine how to do so properly.

All three of the software packages referenced in class (SPSS, SAS, and R) can be accessed through UF Apps (<https://apps.ufl.edu/vpn/index.html>). UF Apps has the most complete stable versions of these packages and avoids you having to worry about licensing and administration. But it will also require that you use the UF VPN if you are working off-campus. You are welcome to access your desired software in other ways, but you are responsible for the licensing and installation/administration of any other implementations you use. Questions about software administration should be directed to the IT help desk (352-392-HELP, helpdesk@ufl.edu), not to me.

Evaluation:

Your performance in this class will be based on weekly assignments, two exams, and class participation as follows:

Assignment	Points	Proportion
14 Weekly Team Assignments	140	46.7%
Exam 1	50	16.7%
Exam 2	70	23.3%
Class participation	40	13.3%
TOTAL	300	100%

Weekly Assignments:

Weekly assignments are designed to give students hands-on experience with the techniques and tools discussed in class. All weekly assignments will be team-based. This is done to reduce your (and my) workload, and also to allow you to get to know and learn from your classmates. Teams will be assigned weekly on a rotating basis such that you will end up working with all other students at least once. The size and details of the teams depend on the size of the class, and will be announced after the first class meeting.

Weekly assignments will involve both manual and software calculations. For all manual computations, you are expected to provide me with all the steps in your calculations. You should do this using Keppel and Wickens' notation and terminology. (In the case of repetitive calculations, you need only provide the details of an illustrative calculation, and state that the others follow in the same fashion.) Note that abbreviated solutions to most problems are provided in Appendix B of K&W. While you are certainly permitted to submit manual computations in a digital format (e.g. using Word with equation editor, or LaTeX), this is likely a huge waste of your time. I am fine with hand-written solutions as long as your writing is legible.

All weekly assignments are due by 10 AM Monday. I prefer that you submit your work via the Canvas class website, but will accept work in my mailbox in 267 Stuzin if necessary. If you are unable to make a particular deadline, you should discuss it with me in advance. You are welcome to begin working on weekly assignments before the class in which the methods are covered.

Exams:

Each exam consists of two parts: One portion is given in class, is closed book, closed notes, and will focus on top-of-mind lessons (fundamental issues of design and analysis). It will be relatively short and be worth approximately 25% of the total exam points. The second portion is take-home, open book and notes, and will focus on computational aspects of the material similar to weekly homework assignments. It will take more time and account for approximately 75% of the exam points. The in-class portion of the two exams will be given February 22 and April 19. The take-home portions will also be distributed on those days and will be due at 4 PM on the following Monday.

Unlike the weekly assignments, your work on the exams MAY NOT be done in consultation with anyone else and MAY NOT utilize resources other than your text and notes.

Late Policy:

Weekly assignments and the take-home portion of the exams are expected to be turned in on time. Weekly assignments are to be submitted via Canvas by 10 AM the Monday after they are assigned, and the take-home portions of the exams are due at 4 PM the Monday after they are assigned. Work that is turned in late will lose 10% of its score for each day it is late.

Class Participation:

Participation is an important component of this class. You are expected to prepare in advance for each class by completing all readings and assignments. You are also expected to contribute in class discussions by asking questions, raising points, and generally enhancing the academic experience for your classmates. Both quality and quantity of participation are important, but their effects constitute a divergent interaction: I am unlikely to be impressed by either insightful contributions that are occasional or by routine contributions that are imperceptive.

Policy on Academic Honesty:

You are permitted (and expected) to discuss class material both with me and with your fellow students out of class. Nonetheless, exams are designed to test your understanding of the material. This goal is circumvented if you collude. The exam work you turn in should be the result of your own analytic thought process. You are not permitted to work on exams with other students or to access material aside from your readings and notes. If you have any questions regarding academic honesty policies, see Alan Cooke or the following website:

http://www.dso.ufl.edu/STG/Ethical_Con.html.

Tentative Class Meeting Schedule and Assignments:

Note: All readings should be completed before the class meeting on which they are assigned. Problem sets, on the other hand, should be completed after the class, and are due the following Sunday.

Date: Wednesday, January 4 (week 1)

Topic: Single-Factor Designs, Logic of ANOVA

Assignments:

- 1) Required reading: K&W, Chapter 1 - 3.
- 2) Complete K&W, Exercises 2.1, 3.2, 3.6 and 3.8.

Date: Wednesday, January 11 (week 2)

Topic: Analytical Comparisons, Trend and Simultaneous Comparisons

Assignments:

- 1) Required reading: K&W, Chapter 4 - 6.
- 2) Complete K&W, Exercises 4.4, 4.6, and 4.7, 5.2, 5.4, 6.1, and 6.5.

Date: Wednesday, January 18 (week 3)

Topic: Assumptions of the Linear Model / Power

Assignments:

- 1) Required reading: K&W, Chapters 7 and 8.
- 2) Complete K&W, Exercises 7.1, 7.3, 8.4, and 8.6.

Date: Wednesday, January 26 (week 4)

Topic: Two-Factor Designs

Assignments:

- 1) Required reading: K&W, Chapters 10 and 11.
- 2) Complete K&W, Exercises 10.1, 10.4, 11.2, and 11.5.

Date: Wednesday, February 1 (week 5)

Topic: Main Effects, Interactions, and Simple Effects

Assignments:

- 1) Required reading:
 - a. K&W, Chapter 12.
 - b. Spiller, S. A., Fitzsimons, G. J., Lynch, J. G. & McClelland, G. H. (2013). Spotlights, floodlights, and the magic number zero: Simple effects tests in moderated regression. *Journal of Marketing Research*, **50** (April), 277-288. (Available in reader.)
- 2) Complete K&W, Exercises 12.1, 12.4, and 12.5.

Date: Wednesday, February 8 (week 6)

Topic: Interaction Components

Assignments:

- 1) Required reading: K&W, Chapter 13.
- 2) Complete K&W, Exercises 13.1, 13.5, and 13.6.

Date: Wednesday, February 15 (week 7)

Topic: The General Linear Model / ANCOVA

Assignments:

- 1) Required reading: K&W, Chapters 14 and 15. (You may skim section 15.8.)
- 2) Complete K&W, Exercises 14.4, 14.5, 15.3, and 15.6.

Date: Wednesday, February 22 (week 8)

Topic: Within-Subject Designs

Assignments:

- 1) Required reading: K&W, Chapter 16 and 17.
- 2) In-class portion of Exam 1.
- 3) Take-home portion of Exam 1 distributed, due 4 PM Monday February 27.

Date: Wednesday, March 1 (week 9)

Topic: Mediation

Guest Instructor: Dr. Aner Sela

Assignments: Required reading (All available in reader.):

- 1) Baron, R. M. & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, **51** (6), 1173-1182.
- 2) Muller, D., Judd, C. M. & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, **89** (6), 852-863.
- 3) Spencer, S. J., Zanna, M. P. & Fong, G. T. (2005). Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Psychology*, **89** (6), 845-851.
- 4) Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, *37* (Aug.), 197-206.
- 5) Hayes, Andrew F. (2013). The simple mediation model (Chapter 4). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. New York, NY: The Guilford Press
- 6) Problem sets: TBA

Supplementary reading:

MacKinnon, D. P. (2008). *Introduction to Statistical Mediation Analysis*. New York: Erlbaum.

<p>No class meeting Wednesday, March 8. Happy Spring Break!</p>

Date: Wednesday, March 15 (week 10)

Topic: Two Factor, Fully Within-Subjects Designs

Assignments:

- 1) Read K&W, Chapter 18.
- 2) Complete K&W, Exercises 16.1, 17.1, 17.3, and 18.2.

Date: Wednesday, March 22 (week 11)

Topic: Mixed Designs

Assignments:

- 1) Read K&W, Chapters 19 and 20.
- 2) Complete K&W, Exercises 19.1, 20.4, 20.5, and 20.6.

Date: Wednesday, March 29 (week 12)

Topic: Three Factor Designs

Assignments:

- 1) Read K&W, Chapters 21 and 22.
- 2) Complete K&W, Exercises 21.3, 21.5, 22.3, and 22.6.

Date: Wednesday, April 5 (week 13)

Topic: Complex Designs

Assignments:

- 1) Read K&W, Chapters 23 and 24.
- 2) Complete K&W, Exercises 23.1, 23.3, 24.1, and 24.3.

Date: Wednesday, April 12 (week 14)

Topic: Random and Nested Designs

Assignments:

- 1) Read K&W, Chapters 25 and 26.
- 2) Complete K&W, Exercises 25.4, 25.5, and 26.3.

Date: Wednesday, April 19 (week 15)

Topic: Class Summary

Assignments:

- 1) In-class portion of Exam 2.
- 2) Take-home portion of Exam 2 distributed, due 4 PM Monday April 24.