Syllabus: Statistical Methods (18:820:581: 01 & 02)
Fall Semester, 2018

Instructor: N. S. Fagley, Ph.D.
Office: Room A355 Psychology Building, Busch Campus
Office hours: Wednesdays 2-4, & by appt. Office Phone: 848-445-3989 (I don’t often check messages at this number; please email instead)
Home phone: will be provided in class (welcome to call from 10am until midnight; you may also leave a message)
Email: fagley@gsapp.rutgers.edu
Class Times & Places: Tuesday (1:45-4:30pm) or Wednesday (4:45-7:30pm) Rm A340; Psych Bldg, Busch. Labs: ARC Bldg. Rm 116 (labs will occur after our break, as indicated on the schedule).

Required Text
Note: Keppel has authored several different statistics textbooks, but only one with these coauthors. Make sure you get the right one. Also, must be the 2nd edition.

Other Required Readings
Other required readings will be posted on the sakai site for the course. The ARC computer lab (next door) is a good place to print readings. They also have SPSS.

Supplemental—if you wish to supplement our work with SPSS
However, I would recommend getting Meyers, Gamst, and Guarino (2012) instead, which has instructions for SPSS in addition to companion chapters about the statistics. When I teach advanced statistics and research design, it is the required text and it often serves as a reference text for GSAPP students working on dissertations, as it covers multiple regression, factor analysis, MANOVA, and structural equation modeling.
Supplemental Text this semester—and required text for my section next semester—includes detailed instruction regarding SPSS.

Objectives
This course will familiarize you with basic statistics and psychometrics including one-way and two-way ANOVA, repeated measures ANOVA, Mixed ANOVA, bivariate correlation and regression, chi square, classical test score theory, reliability, validity, and instrument construction. You will get experience computing the statistical tests and interpreting the results. You will get a chance to assess reliability and validity, and learn the steps in constructing an instrument to measure a construct of interest. Next semester, we will build on these ideas to expand and deepen your understanding of psychometrics (for example, by learning about modern test theory) and to learn more sophisticated ways of analyzing more complex data (for example, by including statistical control of nuisance variables that cannot be controlled through random assignment). Next semester we also step back and consider the strengths and weaknesses of various research design choices and address threats to validity of research.

You will need to make friends with a basic calculator and with the SPSS software (the computer labs, such as the one at ARC have SPSS). If you aren't able to finish the computer portions of the assignments during our scheduled time in the lab, you will need to go on your own. Lab assignments are designed to illustrate the concepts we are learning and to deepen your understanding, as well as to give you some skills in data analysis. You may also wish to get some additional practice and produce printouts of the key output to use in studying, as exams will include SPSS output that must be correctly interpreted.

The statistical techniques and psychometrics you will learn in this course are only
the beginning—the basics necessary for understanding the statistics and measurement concepts typically used in psychological and educational research these days. But don't be discouraged! The material covered in this course is the foundation; learning this material well will provide a strong framework on which future additions can be built. We will continue to build on these foundations next semester by learning more about research design options and their strengths and weaknesses and by extending your knowledge of psychometrics.

Lab sessions are designed to illustrate the concepts, deepen understanding of key issues, and research designs and to teach data analysis, reliability assessment, and item analysis skills in SPSS (which you will need for other courses, practicum activities, and dissertation).

Grading
Grades will be based on two examinations and a team-based computer data analysis project. There will be approximately 8-10 assignments. Assignments will be discussed at the beginning of class on the due date; the answer key will be circulated at that time. I strongly urge you to complete each assignment on time, even though they do not "count" in your grade. Past experience suggests that thorough and timely completion of assignments is related to exam performance. Students are encouraged to work together on assignments. One reason I provide an answer key is so you can see the recommended wording—sometimes in statistics that can be an issue, so pay close attention to that. Exams will be open book. No make-up exams will be allowed unless prior approval is secured. Letter grades will be assigned on each exam and on the project, these will be converted to standard point values, and then these will be averaged and re-converted back to a letter grade for your final course grade.

Cell phone policy
Out of consideration for others, during class please put your cell phone in airplane mode and turn off any other communication devices. So, if you take notes on a computer, please, no emailing, facebook, snapchat, tweeting, IM-ing, etc. If you are "on call" at the clinic or need an exception for some other reason, please email me or speak to me before class and put your phone on vibrate. Thanks.
<table>
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<tr>
<th>Class</th>
<th>Topics and Assigned Readings*</th>
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<td>Tues/Wed Section Dates</td>
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| 1. Sept. 4/5 | **Introductions; Go over syllabus; Advice; Review Key Concepts from prerequisite course in statistics.**
              | Keppel, Saufley, & Tokunaga (1992): ch 1-2                                                    |
| 2. Sept 11/12 | **One Way ANOVA; Using SPSS for data analysis; ARC LAB, Rm 116.**
                  | Keppel, Saufley, & Tokunaga: ch 3, 4, & 5                                                    |
| 3. Sept. 18/19 | **Magnitude of Effect; Power/sample size; ARC LAB Rm 116**
                  | Interpreting significant and nonsignificant findings
                  | (Supplemental: Fagley, 1985, Applied Statistical Power Analysis)
                  | Cumming: chapter 11 (Cohen’s d) & 12 (Post Hoc Power--Illegitimate Power)                   |
| 4. Sept 25/26 | **Factorial ANOVA: significance tests, Omega sq., Power; ARC LAB rm 116**
| 5. Oct. 2/3  | **Factorial ANOVA continued: graphs of cell means; test of simple effects; ARC LAB, Rm 116**
                  | Catch up on readings and review your notes.
                  | (Supplemental: Fritz, Morris, & Richler, 2012, Effect size estimates)                        |
| 6. Oct. 9/10 | **Single-factor Within-subjects Design; ARC LAB, Rm 116**
                  | K, S, & T: ch. 11                                                                           |
| 7. Oct. 16/17 | **Mixed ANOVAs; Brief Review for Exam; ARC LAB, Rm 116 – to prepare project presentations with your team**
                  | K, S, & T: ch. 12                                                                           |
| 8. Oct. 23/24 | **Group Project presentations & Responses to Questions about Exam**                            |
| 9. Oct. 30/31 | **Exam I**                                                                                   |
| 10. Nov. 6/7 | **Correlation (sig., r-square as a measure of strength of association, power and sample size determination, ballantines); ARC LAB, 116**
                  | Keppel,Saufley,& Tokunaga (1992) ch. 15; (Supplemental: Cohen & Cohen (1983) ch 2 up to page 65) |
| 11. Nov. 13/14 | **Prediction/Bivariate Regression; Scatterplots (outliers, heteroscedasticity, curvilinearity); Uses of regression (assessing criterion-related validity, predictive validity, etc). ARC LAB, 116**
                  | Meyers, Gamst, & Guarino: ch. 6(fyi, our required text in spring)
                  | Supplemental: Cohen & Cohen: ch. 2-focus on pp.41-51.                                        |
| 12. Nov. 20/21 | **Factors affecting r (nature of the relation–linear vs curvilinear, restricted range or variability; reliability of measures [correction for attenuation, r_max]; combined groups [differential validity for different subgroups/populations]; artificial dichotomization); Chi Square Analysis**
Analysis by categorizing or dichotomizing continuous variables is inadvisable: An example from the natural history of unruptured aneurysms. Amer. J. of Neuroradiology, 32, 437-440.

K, S, & T: ch. 14 - Chi Square Analysis
Supplemental: Cohen & Cohen 2.11.1 to the end of chpt 2.

**PSYCHOMETRICS**

13. Nov. 27/28  
Psychometrics. Reliability; Coefficient Alpha and other reliability coefficients; Factors affecting reliability—e.g., standardized administration, test length; Spearman-Brown prophecy formula; item analysis; ARC Lab, Rm 116

Kaplan, R.M.(1987): Reliability & Validity (chapter 11);  
Ghiselli, Campbell, & Zedeck (1981), Ch3: Basic Aspects of Psychological Measurement; Chapter 8: Reliability of Measurement  
Supplemental: Cliff (1993) What is and isn’t measurement? [chapter]

14. Dec. 4/5  
Measurement Theory, Reliability of Ratings, Scale Development, Content validity for well-structured domains (table of specifications), Construct validity for more abstract domains (multitrait-multimethod matrices, nomological net, convergent & discriminant validity)ARC Lab 116

Kazdin: interrater agreement; Rosenthal part of ch. 2: Sampling Judges and Encoders—intraclass correlation and application of Spearman-Brown to ratings; Murphy & Davidshofer (1991): Validity of Measurement—Content & Construct

15. Dec. 11/12 Exam II

*Note: Reading assignments may be changed in class or via sakai announcements. Further, some material not included in readings will be included in the lectures or assignments and may be included on the exams.

**Required Readings**


**Supplemental Readings**


