Course description:
This course describes modern statistical methods for analyzing data collected in typical psychology experiments. Perhaps the most common practice in this context is to use t-tests and ANOVA to compare the means of two or more groups. Valid inferences can be drawn from these classical parametric methods provided that certain assumptions about the data (e.g., that they are distributed normally) are true. Recent work has shown, however, that psychology data sets often fail to meet these assumptions, and therefore that classical methods can yield misleading results. This course will describe modern alternatives to the classical parametric methods that make less restrictive assumptions about the data (i.e., the methods are "robust"), and which are much more powerful than traditional non-parametric methods. Emphasis is placed on the analysis of data collected from designed experiments rather than surveys.

Class meeting times:
The course consists of a lecture component (Tuesday, 2:30-4:30, PC-311) and a laboratory component (Wednesday, 12:30-2:30, PC-403). The laboratory will use the free statistical computing environment, R. All of the statistical procedures discussed in the textbook and in class are implemented in R. No familiarity with R is assumed.

Prerequisites:
This course assumes that students have taken an undergraduate course in Psychology statistics, and therefore are familiar with t-tests, ANOVA, and correlation. These methods, and the concepts behind them, are discussed in class but are not covered in the required textbook. To help students refresh their memories of these ideas, I have listed sections of two textbooks as background readings for various parts of the course. Copies of these two books will be put on reserve in the library. Also, these textbooks have been used in previous Psychology statistics courses, so many (most?) Psychology graduate students should have a copy of one of the books.

Grading:
Grades will be based on three in-class exams administered in the statistical laboratory. Students will have access to R during the exams. Each exam constitutes 1/3 of the final grade.

Required textbook:

Required articles:


Suggested sources for background reading:
Part 1: One-Sample & Two-Sample Problems
   Background reading: Chapters 4, 7 & 8 in Howell, or chapters 6-8 in Hays

   • September 13: Sampling Distributions & Statistical Inference
     Reading: Wilcox (1992) and Wilcox, pp. 1-11.

   • September 14: R TUTORIAL #1

   • September 20: Confidence intervals in one-sample cases
     Reading: Wilcox chapter 3 (sections 3.1, 3.3, 3.5-3.7, 3.13) & chapter 4 (4.1-4.4)

   • September 21: R TUTORIAL #2

   • September 27: Comparing two groups
     Reading: Wilcox chapter 5 (sections 5.2-5.9)

   • September 28: R TUTORIAL #3

   • October 4: REVIEW
   • October 5: TEST #1

Part 2: Analysis of Variance
   • October 11: One-way & higher-order designs for independent groups
     Reading: Wilcox chapter 7 (sections 7.1-7.3 & 7.5)
     Background reading: Chapters 11 & 13 in Howell, or chapter 10 & 12 in Hays

   • October 12: R TUTORIAL #4

   • October 18: Comparing multiple dependent groups
     Reading: Wilcox chapter 8 (sections 8.1-8.4 & 8.6)
     Background reading: Chapter 14 in Howell, or chapter 13 in Hays

   • October 19: R TUTORIAL #5

   • October 25: ANOVA miscellanea (focussed vs. omnibus tests; planned vs. post-hoc comparisons; understanding interactions; balanced vs. unbalanced higher-order designs)
     Reading: Wilcox chapter 7 (section 7.4) and Rafter et al. (2002)
     Background reading: Chapter 12 in Howell, or chapter 11 in Hays

   • October 26: R TUTORIAL #6

   • November 1: REVIEW
   • November 2: TEST #2

Part 3: Correlation & Regression

   • November 8: Correlation
     Reading: Wilcox chapter 9
     Background reading: Chapters 9 & 10 in Howell, or chapter 14 in Hays
• November 9: **R TUTORIAL #7**

• November 15: Regression  
  Reading: *Wilcoxon* chapter 10 (sections 10.1-10.9) & chapter 11 (11.1 & 11.2)  
  Background reading: Chapters 9 & 10 in *Howell*, or chapter 14 in *Hays*

• November 16: **R TUTORIAL #8**

• November 22: Analysis of covariance (ANCOVA) - Part 2  
  Reading: *Wilcoxon* chapter 11 (11.8)  
  Background reading: Chapter 16 in *Howell*, or chapter 17 in *Hays*

• November 23: **R TUTORIAL #9**

• **November 29: Review**
• **November 30: Test #3**