Course Objectives
The primary goal of this course is to provide students with an overview of the statistical methods and designs commonly utilized in psychological research to become a good consumer and producer of scientific research products. To this end, first, this course will expose students to various research designs and their logics, such as experimental, quasi-experimental, observational, and longitudinal study designs. Students will also learn how to utilize various techniques of data analysis, including multiple and logistic regression analyses. This course will include lectures and computer lab sessions.

Learning Goals
• To know a range of research methods to validly draw and generalize causal inference.
• To learn about how psychological measures are constructed and tested in research.
• To understand and implement techniques of data analysis to evaluate and report intervention efficacy and effectiveness. The techniques of data analysis will include:
  ✓ analysis of variance (ANOVA)
  ✓ analysis of covariance (ANCOVA)
  ✓ repeated measures ANOVA and ANCOVA
  ✓ multivariate ANOVA (MANOVA) or MANCOVA
  ✓ multiple regression
  ✓ logistic regression
  ✓ principle component analysis (PCA)
  ✓ exploratory and confirmatory factor analysis (EFA and CFA)
  ✓ path analysis and structural equation modeling
  ✓ missing data analysis

Required Textbooks
The class will be taught based on the first two textbooks below and supplemental reading materials.

Grading
• A: 90-100
• B+: 85-89
• B: 80-84
• C: 79 or below

Grading will be based on the summed scores of 1 through 3 below (plus 4 through 6):
1. Two group projects (10 points each; a total of 20 points)
2. Two end-of-month papers (25 points each; a total of 50 points)
3. Final paper (30 points)
4. Up to 10 bonus points may be provided (two mechanisms)
5. Quiz (pass or fail)
6. Human subjects in research training certification is required (pass or fail)

Monthly and Final Papers
Approximately monthly, students will be required to write a critique paper discussing the strengths and weaknesses of an assigned empirical article. The first assignment will be a take-home project. For this first assignment, an empirical article will be announced a week in advance so that students will have a week to read and write up a critique paper (deposit all papers in your own Sakai dropbox). The next two will be open-book in class. Students will have a total of 3 hours to read an assigned article and submit their critique paper online. For the exact questions and writing format, follow the posted instruction at http://gsappweb.rutgers.edu/cstudents/comps/GenComps/GenComps05_q1.pdf. Be sure to adhere to the specified format guidelines. Written feedback on each paper will be provided within 2 weeks. Note that these papers are individual projects. No discussions or collaborations between students can be tolerated (see the Academic Integrity policy). The best three papers will be selected in each round. Ten bonus points will be given to the students, if they agree to make selected papers available. These papers will be posted by the instructor after removing any personally identifying information.

Quiz
Students are expected to demonstrate their knowledge of the concepts listed in the textbook by Shadish et al. (2001, pp 505-513) and also those covered in class for the research designs section for causal inference (through the first four sessions). Students will be provided with two separate lists of definitions and key concepts. The task is to match them correctly. Students must answer 80% questions correctly to be considered to pass this quiz. No passing grades will be given if students fail to pass this quiz (30 min allocated for this quiz).
Group Projects
There will be two computer projects. For each assigned computer lab project, three to five students may form a group and write one report collaboratively. On the report cover, indicate all group members who participated.

APA publication style
All papers should be written using the APA style (6th ed.).

Human Subjects in Research Certification
Students must submit a CITI certification report that will satisfy the Rutgers IRB requirement. The CITI training may take a full day to complete. So plan ahead. Without this certification, no passing grades will be given.

Class Attendance and Remediation
If students anticipate that they may be late for class, have to leave class early, or be absent from class, it should be communicated in writing (via e-mail) at their earliest convenience. Acceptable excuses include observing religious and recognized cultural holidays that fall on the day of class, attending conferences, or unforeseen emergencies. Four missed classes for any reasons will trigger a remedial plan. If the remedial plan is subsequently not met as drawn up between the instructor and the student, a passing grade (B or above) will not be given.

Class Presentation and Participation for Bonus Points
Students can receive 10 bonus points for volunteering to present an article and discuss its strengths and weaknesses in class for 15 minutes. Anyone interested in this option should discuss details with the instructor at least 2 weeks in advance so that time allocation and announcement can be made.

Computer/Cell Phone Use in Class
If students are expected to send or receive urgent e-mails, texts, or calls during class, their unanticipated and urgent needs should be communicated to and approved by the instructor prior to class. All cell phones should be turned off or in silent mode. All computing devices should be used only for the purpose of class-related activities.

Academic Integrity
All Rutgers students should review and adhere to the University principles of academic integrity, available at: http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers/

Accommodations due to Disability
If you seek accommodations due to a documented disability, you may arrange for these through the Office of Disability Services, Kreeger Learning Center, 151 College Avenue; dfoffice@rci.rutgers.edu
Course Schedule (Listed chapters and articles are required readings)

1/18  Learning Goal: Research Methods

**Causal inference and randomized experiments**
- Shadish et al. (2001). Chapter 1 – Experiments and causal inference
- Shadish et al. (2001). Chapter 2 – Statistical conclusion validity and internal validity
- Shadish et al. (2001). Chapter 3 – Construct validity and external validity

1/25  Learning Goal: Research Methods

**Randomized clinical trials: Challenges and current issues**
- Shadish et al. (2001). Chapter 8 – Randomized experiments
- Shadish et al. (2001). Chapters 9 & 10 – Ethical issues, randomization, treatment implementation, and attrition

2/1  Learning Goals: Research Methods and Data Analysis Techniques

**Reproducibility, replicability, and open research practices**
- Shadish et al. (2001). Chapters 4 & 5 – Quasi-experimental designs (lacking control groups or pretest measures)

2/08  Learning Goals: Research Methods and Data Analysis Techniques

**Other designs for inference**
• Shadish et al. (2001). Chapters 6 & 7 – Interrupted time-series and regression discontinuity
• Shadish et al. (2001). Chapter 13 – Methods for drawing inference from multiple studies

2/15  Learning Goals: Research Methods and Data Analysis Techniques

**Quiz**

**Data screening and missing data**
• Tabachnick & Fidell (2007). Chapter 4 – Screening data and missing values
  - *Chapter 1 - An introduction to missing data*
  - *Chapter 2 - Traditional methods for dealing with missing data*

2/22  Learning Goals: Research Methods and Data Analysis Techniques

**1st mid-term paper** will be announced (due 3/1)

**Analysis of (co)variance and multiple regression** – shared assumptions, model selection, and interpretation
• Tabachnick & Fidell (2007). Chapters 5 and 6
• Fiedler, K., Schott, M., & Meiser, T. (2011). What mediation analysis can (not) do. *Journal of Experimental Social Psychology, 47*(6), 1231-1236. doi:10.1016/j.jesp.2011.05.007

3/1 Learning Goal: Data Analysis Techniques

**Computer Lab** (ARC Room #)

**Group computer project #1** will be assigned (due 3/8)

**Multiple regression** – testing mediations and moderations (interactions)

• Tabachnick & Fidell (2007). Chapters 5 and 6


3/08 Learning Goal: Data Analysis Techniques

**Logistic regression**


3/15

**No class, Spring Break**

3/22 Learning Goal: Data Analysis Techniques

**Repeated measures ANCOVA and multivariate ANCOVA**

• Tabachnick & Fidell (2007). Chapter 7

3/29 Learning Goals: Research Methods and Data Analysis Techniques

2nd mid-term paper (limited to 3 hours in class, open-book, place your paper in your drop box on Sakai)

4/05 Learning Goals: Data Analysis Techniques and Psychological Measurement

**Principal component analysis (PCA) and factor analysis (FA)**
• Tabachnick & Fidell (2007). Chapter 13

4/12 Learning Goals: Data Analysis Techniques and Psychological Measurement

**Computer Lab** (ARC Room #)

Group computer project #2 will be assigned (due 4/18)

**Principal component analysis (PCA) and factor analysis (FA)**
• Tabachnick & Fidell (2007). Chapter 13

4/19 Learning Goals: Data Analysis Techniques and Psychological Measurement

**Basic concepts of structural equation modeling (SEM)**
• Tabachnick & Fidell (2007). Chapter 14

4/26 Learning Goals: Data Analysis Techniques and Psychological Measurement

**Two theories of testing and scoring: Validity and reliability**


5/03
**No class, reading week**

5/10
**Final term paper** (limited to 3 hours in class, open-book, place your paper in your drop box on Sakai)