Psychology 205: Statistics and Experimental Design
Prerequisite: PSY101, CMP112, and at least sophomore standing or special permission from the instructor.

Dr. David Simpson, Professor of Psychology
Spring 2017 Syllabus:

**Section B:** MWF 8:00-9:10 Main 113 **Final: Tuesday May 9: 8:00 a.m.**
Lab: Wednesdays 10:40 -1:10 Location: TC13

**Section A:** MWF 9:20 to 10:30 Main 113 **Final: Monday May 8: 8:00**
Lab: Wednesdays 1:20 – 3:50 TC13

**Office:** Rankin 211 **Office Hours: 11:40 – 1:00 M - F and by appointment**

**Phone:** Office: 262 - [524]-7252  
Home (North Lake/Hartland):262 - 966-7206

**Email:** [dsimpson@carrollu.edu](mailto:dsimpson@carrollu.edu)

Carroll “Faculty Profile”: [http://www.carrollu.edu/programs/psychology/faculty_profile.asp?id=2F38](http://www.carrollu.edu/programs/psychology/faculty_profile.asp?id=2F38)


**This is how I teach:** [http://teachpsych.org/page-1703896/1521560](http://teachpsych.org/page-1703896/1521560)

**Important Links:**

There exists a wealth of resources online for teaching research methods and statistics. Here are a few of my current favorites.

- [http://teachpsychscience.org/links.asp](http://teachpsychscience.org/links.asp)

Here a link for "chi-square calculator" on the Internet that I have found useful. I primarily use SPSS for Chi-square only when I have a survey and am interested in a Chi-Square analysis on the cross-tabulations. In that case, I do NOT need to weight cases.

[http://www.quantpsy.org/chisq/chisq.htm](http://www.quantpsy.org/chisq/chisq.htm)

Here is a link to software which calculates statistical power:

[http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/](http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/)

Here is an informative link about how to randomly select or randomly assign participants:


OPTIONAL but recommended (and what a deal!)

*** Simpson, David D. *An Outline of Basic Data Analyses in Psychology: Examples, Exercises, and Applications*

**Also required:** A Texas Instrument 30 calculator or its equivalent with statistical functions.

**About your professor:**
While earning my A.B. in psychology at Oberlin College in Ohio, I developed strong interests in humanistic psychology, educational innovation, and Spanish literature --- and avoided statistics and research methods as long as I could! I had a change of heart while I was a graduate student at Ohio State University where I earned my M. A. and Ph.D. degrees. There I took twelve statistics and research methods courses in addition to publishing research in experimental social psychology. I have been teaching Introductory Psychology, Statistics and Experimental Design, Social Psychology, Freshman seminars, Research Seminar, Psychological Testing and Assessment and special courses (e.g. “Electronic Surveys,” “SPSS,” “Why War?”, “Pioneering Web 2.0 Internet Tools”) at Carroll since February of 1978. This is my first job!

**Examinations:** (500 points)
Examinations will occur in **THE LAB CLASSROOM** on the dates specified in this syllabus. These five examinations will measure both conceptual understanding and computational skills.

**Labs**
Lab attendance and classroom involvement will affect whether a student who has a “borderline” grade should receive the higher letter grade and the quality of letters of recommendation which I write for you---if you at some time ask me to write one (and if I agree to do so!).

*Statistics is a language, a way of thinking about things, and a set of tools useful for answering questions. Using statistics on a regular basis is the best way to learn this language and to learn how appropriately to use statistical tools. Therefore, it is very important that you attend labs, work problems I assign you from the text, and*
actively participate in data collection exercises. To further help you understand uses of statistics I shall often share with you examples of applications of statistics from my own work or that of student and faculty researchers.

Cumulative Final Examination: (100 Points)
Course Grade: (Based on 600 Total Points)

A = 558 and above
AB = 540 to 557
B = 498 to 539
BC = 480 to 497
C = 420 to 479
D = 360 to 419
F = Below 360

Attendance:
I expect that you will attend each class and each laboratory prepared, attentive, and on time. Exams should be taken on time. Work which is handed in should be your own, neat, and on time. I expect honesty and civility in behavior.

Approximate Weekly Schedule

<table>
<thead>
<tr>
<th>Week of</th>
<th>READ</th>
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<tbody>
<tr>
<td>January 25</td>
<td>Introduction to Statistics and Experimental Design</td>
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<tr>
<td>January 30</td>
<td>Frequency Distributions</td>
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<td></td>
<td>Characteristics of Distributions:</td>
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<td>Central Tendency and Variability</td>
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Wednesday February 1:
Examination # 1: 100 points

| February 13        | z-Scores                                  | Chapter 05 |
|--------------------|-------------------------------------------|
| February 22        | Correlation (r) and Regression             | Chapters 15; 16 |

February 27
Examination # 2: 100 points

| March 6            | Introduction to Hypothesis Testing        | Chapter 08 |
|--------------------|-------------------------------------------|            |
Approximate Weekly Schedule

**March 16**: Introduction to the t Statistic  
Chapter 09

**SPRING BREAK**: Week of March 13

**March 20**: Two-group Experimental Designs  
Chapter 10 – 11

**March 29**: Examination #3: 100 points

**April 03**: Introduction to Analysis of Variance  
Chapter 13

**April 12**: Examination #4: 100 points

**April 17**: Factorial Experimental Designs  
Chapter 14

**April 26**: Examination #5: 100 points

**May 01**: Review, Integration and Application:

**Section B**: Final: Tuesday May 9: 8-10 a.m.

**Section A** Final: Monday, May 8: 8 – 10 a.m.
Carroll Policy Statements

Statement on Academic Integrity – The Carroll Academic Integrity Policy is located in your student handbook. I encourage you to familiarize yourself with it. If a student violates this policy in any way, I reserve the right to impose a sanction of failure on the assignment/assessment or failure in the course. If you have questions about appropriate citations, please ask.

Accommodation for Disabilities – Any requests for accommodation must be made through the Disability Services Coordinator at Carroll. I will make appropriate accommodations once I receive notification from that office and have met with you privately.

Modifications to the Syllabus: The instructor and Carroll reserve the right to modify, amend, or change the syllabus (schedule, course requirements, grading policy, etc.) as the curriculum and/or program require(s).

What Should You Know and Be Able to Do at the End of this Course?

Mastery of skills and concepts will be regularly assessed via exams, lab exercises, individual and group conferences, journal reading, and mentored computer applications.

I. Factual Knowledge: Understanding Important Concepts and Terms:

- Inferential vs. Descriptive Statistics
- Parametric vs. Nonparametric Statistics
- Random Sampling vs. Random Assignment
- Independent Variable (IV) vs. Dependent Variable (DV)
- Sample vs. Population
- Levels of Measurement of Data
- Sample Statistic vs. Population Parameter
  - Simple Frequency Distribution vs. Grouped Frequency Distribution
- Abscissa vs. Ordinate
- Real Limits vs. Apparent Limits of a Class Interval
Negatively Skewed vs. Positively Skewed vs. Normal Distributions
Symmetric vs. Asymmetric Distributions of Scores
Relative vs. Cumulative Proportions in Frequency Distributions
Measures of Central Tendency vs. Measures of Variability
Mean vs. Median vs. Mode
Range vs. Standard Deviation vs. Quartile Deviation
"Biased" (Population) vs. "Unbiased" (Sample) Standard Deviation
Variance
Percentile Point vs. Percentile Rank vs. Standard Score
z-score
The Standard Normal Curve
Scatter Plots; r; "positive", "zero"; and "negative" correlations
Homoscedasticity of Variances vs. Homogeneity of Variances
Slope and Intercept of a Linear Regression Equation; Standard Error of Estimate
Null Hypothesis (H₀) vs. Alternative Hypothesis (H₁)
Type I vs. Type II Errors
Sampling Error
Sampling Distribution
One-tailed (Directional) vs. Two-Tailed (Non-directional Hypotheses)
Rejecting vs. Failing to Reject the Null Hypothesis
Single Sample z vs. Single Sample t
Independent (between groups) t vs. Correlated (related groups; Within-subjects) t
Statistically Significant (Reliable) Results
Analysis of Variance (ANOVA); F-test
Post Hoc Tests (e.g. Tukey's HSD)
Sums of Squares (SS); Mean Squares (MS); F-ratio
Factorial Experimental Designs
Levels of an Independent Variable
Chi-Square (X²)
True Experiment vs. Intact Groups Design
Between Subjects IV's vs. Within Subjects IV's
II. Applied Knowledge and Skills:

A. Use Statistical Tables to Find Critical Values of Statistics
- Pearson's r
- z
- t and F
- q (the studentized range statistic used in Tukey’s HSD)
- Chi-Square ($X^2$)

- Draw random samples and randomly assign subjects to conditions
- Determine experimental design to use and appropriate data analyses to perform
- Recognize assumptions made when choosing particular parametric statistic or deciding instead to use a nonparametric statistic

- Know critical values for a 1-tailed and a 2-tailed z at the .05 alpha level
- Know correspondence between measures of central tendency and measures of variability. Which measure of variability should be used with which measure of central tendency? Why?

- Know how and when to find proportions, percentile points, and percentile ranks using the standard normal curve

- Know how to find percentile points and percentile ranks when a distribution of scores is not normally distributed

- Know how to read graphs and tables for both descriptive statistical analyses (e.g. surveys) and results of experiments. Know how to draw graphs of the results of a survey or experiment.

- Be able to compute Tukey's HSD and use subscript notation to communicate which post hoc comparisons are statistically significant.

- Be able to recognize when a particular statistical computation is most likely erroneous.

- Read the results section of journal article with increased understanding.

- Know statistical analysis resources available on campus.

- Know how to interpret SPSS/PASW (Statistical Package for the Social Sciences)

- Know nonparametric analogues of major parametric statistics

- Know the advantages and disadvantages of parametric vs nonparametric inferential statistics. When should one versus the other be used?

- Understand the concept of statistical power.