Course Description

The two-semester courses of Psyc 210A and Psyc 210B in the department of Psychology are aimed to teach graduate students how to present and analyze data in psychology at Ph.D. level. Topics of the courses include methods for describing data, exploratory data analysis, elementary probability theory, normal, $t$, $\chi^2$, and $F$- distributions, hypothesis testing, correlation and regression analysis, analysis of variance (ANOVA), analysis of covariance (ANCOVA), logistic regression, and log-linear modeling.

While theoretical background of each analytic method will be introduced, the focus of the courses will be on the applications. Data and examples from empirical studies will be used to elaborate when an analytic method is appropriate and how the method can help address the research questions or test the research hypotheses. Students practice using each method through exercises, project-based learning modules, take-home assignments, mid-term examinations, and final projects.

Although designed for graduate students in psychology, the courses should also be appropriate for graduate students in other disciplines who are interested in learning skills of applied statistics and data analyses. With the permission from the instructor, undergraduate students with introductory statistics background may also be enrolled in the courses.

Psyc210B is a continuation of Psyc210A. Topics include categorical data analysis (chi-square statistics), correlation, general linear models (GLM: including topics on regression, ANOVA, and ANCOVA), and generalized linear models (GLMed: including topics on logistic regression and log-linear modeling). Non-parametric methods and exploratory factor analysis will be introduced if we have extra time. The main statistical tool used in the course is R, program codes for IBM SPSS will also be given. Students can also choose other statistical packages (e.g., SAS, STATA, and matLab) for their course work. Statistical analysis is the major component of this course. This course should build a solid foundation for students who may be interested in pursuing more advanced statistics as generalized linear modeling, latent class analysis, structural equation modeling, and/or multilevel modeling.

Learning Objectives and Expected Skill Development

Students who successfully complete this course will be able to:

1) Understand the concepts and principles related to each of the statistical methods covered in this course, including: categorical data analysis, multiple regression analysis, interaction in regression, regression diagnostics, analysis of covariance, logistic regression, log-linear modeling;

2) Know how to set up the corresponding statistical model and statistical hypotheses;

3) Write corresponding program syntax to generate the results of interest;
4) Read and interpret the results and output;
5) Write statistical report professionally, and
6) Communicate the related statistics to general audiences.

Prerequisites
Psyc210a or an equivalent course.

Recommended books (for references or extra reading):
Howell, D.C. (2012). *Statistical methods for psychology* (8th edition). Wadsworth. [this book was also used in Fall 2018.]


Course Requirements:
This is a 4-credit-hour graduate-level course. Success in this course is based on the expectation that students will spend a minimum of 12 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).

Students have to finish all the following course work to get credit for this course.

Course participation:
Students enrolled in this course are expected to contribute to the course through class participation (attending classes, asking/answering questions, offering comments).

Timely exercises (approximately 55% of grade):
Exercise will be given weekly (except in the weeks with homework or examination). This will give us immediate feedbacks on whether students understand the materials. A weighted average will be used to compute the grade for the weekly exercises.

Three Homework Assignments (approximately 35% of grade):
Data will be given for each homework assignment with some specific questions or general guidelines. Students are expected to develop an analytic plan, conduct the analyses, and write the homework as a research paper in APA (or a professional) style. Students have ONE opportunity to re-do and re-submit one homework assignment (but the grade for the re-submission will not exceed 85% of the full points).

In-class examination (approximately 10% of grade):
In April, we will talk more on this when it comes.

All the course work should be submitted by the due time. A 10% of the grade will be deducted for each day late (a late day begins when it’s past the due time). In general, extension will not be granted except in the case of personal emergency. Please do not ask for extension due to conference, lab commitment, and/or computer/technology-related problems.
Here is the guideline of how the course grade will be computed (but keep in mind that the actual computing algorithm may be adjusted at the discretion of the course instructor):

Timely exercises: the points of each exercise will be rescaled to a 100 scale, and a simple average of the scores will be used as the practice points.

Homeworks: The points of each homework will be rescaled to a 100 scale, a simple or weighted average of the scores will be used as homework points.

In-class examination: the raw exam point will be rescaled to a scale with mean 80 and sd 10.

The overall course points = 55% practice point + 35% HW point + 10% exam

Based upon the course points, final course letter grade will be assigned (with course participation being taken into consideration).

**Guideline for letter grade:**

<table>
<thead>
<tr>
<th>Points</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>95+</td>
<td>A</td>
</tr>
<tr>
<td>90-95</td>
<td>A-</td>
</tr>
<tr>
<td>85-90</td>
<td>B+</td>
</tr>
<tr>
<td>80-85</td>
<td>B</td>
</tr>
<tr>
<td>75-80</td>
<td>B-</td>
</tr>
</tbody>
</table>

**Computing**
The teaching statistical packages is R (program codes for IBM SPSS statistics and questions, if any, related to IBM SPSS will be fully addressed in class). Students can use other statistical package for the course work (with the understanding that we may not be able to provide support for the other statistical tools).

**Academic integrity**
Academic integrity is central to the mission of educational excellence at Brandeis University. Each student is expected to turn in work completed independently, except when assignments specifically authorize collaborative effort. **It is not acceptable to use the words or ideas of another person – be it a world-class philosopher, your fellow classmate, or your online helper – without proper acknowledgement of that source.** This means that you must use author citations, endnotes, and, where appropriate, quotation marks to indicate the source of any phrases, sentences, paragraphs, or ideas found in published volumes, on the internet, or created by another student.

Violations of University policies on academic integrity may result in failure in the course or on the assignment, or in suspension or dismissal from the University. If you are in doubt about the instructions for any assignment in this course, it is your responsibility to ask for clarification.
Collaboration
Students are welcome to discuss the course’s materials, practices, and homework assignments with each other (for better understanding and learning). But the work submitted for grading MUST be your own. For example, you must write your own code, run your own data analyses, and explain the results in your own words and with your own graphical presentations. You may not submit the same or similar work to this course that you have submitted or will submit to another course or for another project. You may not provide or make available solutions to practices/homework assignments to other students who are taking this course or may take this course in the future.

Special needs
Students with a documented disability on record at Brandeis University and wishing to have a reasonable accommodation made for this class should let me know the needs in the first week of the course. Students should then provide me a proposed accommodation with appropriate document, if any. A mutually agreed arrangement will then be documented and be followed for this course.

Rules of using computer/cell phone in class time
The use of cell phone is prohibited during class time. Computer (including laptop, ipad etc.) can only be used for taking class notes. Computer can be used for statistical computing only when I ask you to do so. I assume that you are here because you want to learn. Using a cell phone or laptop, or computer to talk, text, email, or surf the web on non-course related matters is disrespectful to me and to your fellow students.
I will ask you to turn off the computer or leave the classroom if the computer or phone is used for any work unrelated to the class in session (including homework for this course). No exceptions.
## Approximate class schedule *(subject to change):*

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Readings/Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16</td>
<td>Review &amp; Mixed-design</td>
<td>Exercise 1</td>
</tr>
</tbody>
</table>
| 1/22-1/23 | No class on Monday 1/21  
               | class on Tuesday 1/22 (Brandeis Monday)  
               | Correlation analysis: simple correlation | H(Ch.s 9&10)  
               | Exercise 2 |
| 1/28-1/30 | Linear regression: foundations & simple linear regression, partial correlation & part correlation | H(Ch. 9)  
               | Exercise 3 |
| 2/4-2/6 | Statistical control, Multiple regression: statistical model, model fit statistics, and interpretation Assumptions | H(Ch.15)  
               | HW#1 |
| 2/11-2/13 | Multiple regression: Assumptions and Diagnostics (Multi)collinearity | H(Ch.15)  
               | Exercise 4 |
| 2/18-2/20 | [Winter break, no classes at Brandeis]  
               | Multiple regression: Continuous vs. categorical predictors, interaction/moderation | H(Ch.15)  
               | Exercise 5 |
| 2/25-2/27 | Multiple regression: interaction of continuous predictors, centering |               |
| 3/4-3/6 | Multiple regression: interaction of continuous predictors, centering | Exercise 6 |
| 3/11-3/13 | General linear hypothesis (GLH) testing, modeling strategy | Exercise 7 |
| 3/18-3/20 | Regression diagnostics, Sensitivity analysis, Data transformation | H(Ch.16)  
               | HW#2 |
| 3/25-3/27 | Polynomial regression, spline regression, quantile regression | Exercise 8 |
| 4/1-4/3 | Analysis of Covariance (ANCOVA)  
               | General linear models (regression & ANOVA) | H(Ch.15)  
               | Exercise 9 |
| 4/8-4/10 | The concept of Mediation, $\chi^2$,  
               | Categorical Data Analysis: goodness of fit test & test of independence | H(Ch.6)  
               | Exercise 10 |
| 4/15-4/17 | Logistic regression  
               | In-class examination (4/17) | In-class examination |
| 4/22-4/24 | [Spring break, no classes at Brandeis]  
               | Generalized linear model: | Final homework  
               | Poisson regression/Log-linear model |
Last class on 5/1