**INTERMEDIATE STATISTICS**
Spring 2018 Syllabus

**Professor:** Robert (Bob) Apel, Ph.D.
**Office:** Center for Law and Justice, Room 579H
**Phone:** 973-353-5216
**E-mail:** robert.apel@rutgers.edu

**Class Location:** Center for Law and Justice, Room 567
**Class Time:** Wednesday, 10:00 to 12:40
**Office Hours:** By appointment

**COURSE DESCRIPTION**

This is a course in quantitative methods for discrete and limited dependent variables, and provides a survey of statistical models for cross-sectional outcomes that do not conform to a normal distribution. In fact, most of the outcomes studied in criminology and criminal justice are actually discrete rather than continuous, or otherwise depart from normality in a significant way. A solid foundation in models for limited dependent variables is therefore necessary for individuals who intend to conduct any kind of quantitative criminological research. Following a brief review of the linear model (covered in depth in Introductory Statistics), this course will provide an overview of models for outcomes that are binary, ordinal, nominal, count, and censored. These models will be grounded in the method of maximum likelihood estimation. Time permitting, more advanced topics will be considered, including event history analysis, latent variable models for discrete outcomes (e.g., latent class analysis, item response analysis), and quantile regression models.

**Course Objectives**

- Expertise with the logic and method of maximum likelihood estimation.
- Ability to discern the type of regression model that is suitable for any type of dependent variable, to estimate the model, and to correctly interpret the resulting parameter estimates.
- Familiarity with the Stata software for a wide range of statistical applications.
- Application of a maximum likelihood model to an independent research problem.

**Course Prerequisite**

It is assumed that students have completed at least one semester of graduate-level statistics, and are comfortable with the use of computer-based statistical programs (e.g., SPSS, SAS, Limdep, Stata). For doctoral students in the School of Criminal Justice, the prerequisites include the pre-doctoral “Stats Camp” as well as Introductory Statistics (27:202:542). For students from other programs, this includes courses leading up to and including full coverage of linear regression analysis. This course will provide only a cursory review of the least squares regression model, as it will be assumed that students are knowledgeable about least squares estimation.
COURSE MATERIALS

The course will rely heavily on the statistical program, Stata, for homework assignments in data analysis and interpretation, as well as for an end-of-semester research project. Students are not required to purchase the program, although Rutgers doctoral students are entitled to a free, temporary but renewable Stata license (specifically, Stata MP2 15 for Linux, Mac, or Windows) through the university's software portal (https://software.rutgers.edu). Special prices and licenses for students are also available on the software website (http://www.stata.com). Students who do not wish to purchase the software or are not entitled to a university license will have access to it in the School of Criminal Justice computer lab (Center for Law and Justice, Room 567).

Stata is a very flexible statistical program, and students are highly encouraged to invest some time in familiarizing themselves with its features and functionality. Although some class time each week will be devoted to Stata-related issues, students will largely be expected to learn the ins and outs of the program on their own or in small groups. The homework assignments will provide some guidance about specific procedures that students will be asked to perform. Note that there is also a very active online community, known as Statalist, from whom Stata users can seek answers to analytical questions or problems (http://www.stata.com/statalist), and good analytical tutorials are available from UCLA’s Academic Technology Services (http://www.ats.ucla.edu/stat/stata). There are also many add-ons which are written by advanced users, and made available free of charge on the web.

Recommended Textbooks

There are no required textbooks for this course. However, students interested in improving their comprehension of the material and software are encouraged to add the two following books to their library:


Course Handouts

In lieu of a textbook, 300+ pages of material covering the topics considered in this course will be made available by the instructor as a series of chapters in portable document format. These technical notes and accompanying datasets will be posted on the course Twitter account (@RutgersSCJ641). They provide in-depth treatment of the statistical rationale underlying each model, in addition to concrete applications using Stata. The notes also provide treatment of additional models which tend to not be covered in textbooks. Experience indicates that students benefit greatly from these notes, and they are strongly encouraged to read them prior to the class in which they will be covered. Students are free to keep the notes for their own personal use and to refer to them as needed, with the understanding that they are the intellectual property of the instructor.
COURSE GRADING

Students will be graded on the basis of three criteria: class preparation, homework assignments, and an empirical project. The specific breakdown will be as follows:

<table>
<thead>
<tr>
<th>Grading Criteria</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Class Preparation</td>
<td>10%</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>40%</td>
</tr>
<tr>
<td>Empirical Project</td>
<td>50%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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</tbody>
</table>

The grading scale that will be used for the final semester grades is as follows:

- A: 90.0% or higher (Outstanding)
- B: 80.0% to 89.9% (Good)
- C: 70.0% or 79.9% (Satisfactory)
- F: 69.9% or lower (Failing)

Class Preparation (10%)

Students are expected to attend every class and to arrive to class on-time. If a scheduling conflict arises, the instructor expects to be notified in advance. In addition, students are to have read the assigned material and be prepared to answer questions. Most importantly, students are encouraged to ask questions and to contribute to classroom discussion concerning the material to be covered each week.

Students are also encouraged to bring their own analysis-related questions and problems to the class for discussion, and to bring articles which provide interesting empirical applications to the attention of the instructor and their classmates. Since the course will be focused on applied criminological research, this is the perfect setting to have in-depth discussions about research methods and statistical analysis.

Homework Assignments (40%)

There will be about five (5) homework assignments, each equally weighted in the final grade, which are to be turned in at the beginning of the class periods in which they are due. The assignments will be problem sets using data made available by the instructor. The objective of the homework assignments is to give students hands-on experience using statistical software (Stata) to estimate, interpret results from, and diagnose potential problems in the empirical models covered in class. It is expected that the topics to be covered in the homework assignments will be as follows:

- Assignment #1 – Review of the Linear Model
- Assignment #2 – Binary Response Model
- Assignment #3 – Maximum Likelihood Estimation
- Assignment #4 – Multinomial and Ordered Response Models
- Assignment #5 – Event Count and Censored Models

Students are encouraged to work in pairs or in small groups on the homework assignments. While joint results may be reported, each student must provide his or her own interpretations of the findings. Late homework assignments will not be accepted, unless the student has given prior notification and approval has been granted by the instructor.
Research Project (50%)

Instead of a final exam, the semester will culminate in an independent research project of the student’s choosing. Students are to submit a written report in the form (although not necessarily the length) of a journal manuscript, with sections for an introduction, literature review, hypotheses, data, methods, results, and discussion/conclusion, as well as references, tables, and figures. Because this class is concerned with quantitative methods, students will be expected to demonstrate proficiency with the statistical model that they choose for their project. This means that they will have to think carefully about the underlying assumptions of their model, evaluate the fit of the model to the data, diagnose potential violations of key assumptions or other problematic issues, and identify plausible solutions to these issues.

Details about this project will be left intentionally vague, so that students have maximum flexibility in identifying the question they intend to study. Students are urged to start thinking right away about potential topics for their project. Done strategically, this project can serve as the start of a comprehensive exam, dissertation prospectus, or other empirical paper. Students are welcome (and are in fact encouraged) to use this project as an opportunity to consult with their faculty advisor or mentor, and to make substantial progress on ideas that can lead to a publishable manuscript.

COURSE POLICIES

Announcements

As needed, e-mail will be utilized to post course announcements (e.g., class cancellation due to inclement weather) as well as to occasionally provide links to items that are relevant for the statistical topics covered in this course (e.g., journal articles).

Students with Disabilities

Students with a documented disability who wish to discuss special accommodations should contact the instructor as soon as possible at the beginning of the semester. For information on required documentation and reasonable accommodations, students may consult the website of the Office of Disability Services at http://disabilityservices.uw.rutgers.edu.

Counseling Center

Students who experience any psychological or other difficulties that may interfere with their performance in this course should be aware that the university offers a variety of free, confidential services to students. For information on psychological and counseling services, students may refer to the website of the Counseling Center at http://counseling.newark.rutgers.edu.

Classroom Climate

Disruptive behavior in the classroom cheats other students of the opportunity to learn. Examples include arriving late to class, leaving and re-entering the classroom during lecture, talking excessively, using cell phones, eating, reading outside material, and persisting in speaking without being recognized. The instructor reserves the right to ask disruptive students to leave the classroom.
### Academic Integrity

The instructor will uphold Rutgers University policies concerning ethical behavior and academic integrity, and students are expected to familiarize themselves with these policies. The relevant principles, policies, and disciplinary procedures are available from the university’s website at http://academicintegrity.rutgers.edu.

### COURSE SCHEDULE

This schedule is subject to change depending on time demands and adverse weather events.

<table>
<thead>
<tr>
<th>Class Date</th>
<th>Discussion Topic</th>
<th>Assignments Due</th>
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<tbody>
<tr>
<td>Wed., Jan. 17</td>
<td>Course Introduction</td>
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<tr>
<td></td>
<td>Review of the Linear Model</td>
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<tr>
<td>Wed., Jan. 24</td>
<td>Review of the Linear Model (cont’d)</td>
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<tr>
<td>Wed., Jan. 31</td>
<td>Binary Response Models</td>
<td>Homework Assignment #1</td>
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<tr>
<td>Wed., Feb. 7</td>
<td>Binary Response Models (cont’d)</td>
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<tr>
<td>Wed., Feb. 14</td>
<td>Binary Response Models (cont’d)</td>
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<tr>
<td>Wed., Feb. 21</td>
<td>Maximum Likelihood Estimation</td>
<td>Homework Assignment #2</td>
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<tr>
<td>Wed., Feb. 28</td>
<td>Maximum Likelihood Estimation (cont’d)</td>
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<tr>
<td>Wed., Mar. 7</td>
<td>Maximum Likelihood Estimation (cont’d)</td>
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<tr>
<td>Wed., Mar. 14</td>
<td>NO CLASS – SPRING RECESS</td>
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<tr>
<td>Wed., Mar. 21</td>
<td>Ordered Response Models</td>
<td>Homework Assignment #3</td>
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<tr>
<td>Wed., Mar. 28</td>
<td>Multinomial Response Models</td>
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<td>Wed., Apr. 5</td>
<td>Event Count Models</td>
<td>Homework Assignment #4</td>
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<tr>
<td>Wed., Apr. 12</td>
<td>Event Count Models (cont’d)</td>
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<tr>
<td>Wed., Apr. 19</td>
<td>Censored Regression Models</td>
<td>Homework Assignment #5</td>
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<td>Wed., Apr. 26</td>
<td>TBD</td>
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<tr>
<td>Wed., May 3</td>
<td>NO CLASS – SEMESTER IS OVER</td>
<td>Research Project</td>
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