**Applied Regression Analysis**

**EPSY/PSYC 581, Section A (CRN 39943 and 40010)**

## Tuesdays 9:00-11:50 a.m.

**Spring, 2016 1/19/2016-5/10/2016**

Instructor: Dr. Cromley

Office: Rm. 10D Education Building

E-mail: jcromley@illinois.edu (by far the best way to reach me)

Telephone: (217) 300-1092 Fax: (217) 244-7620

Office hours: Wed 3:00 pm – 5:00 pm in person or electronically via or Skype or other video conferencing (please email me so I know to log on). First come, first served (no appointments possible within the Wed. 3-5 time slot). Other times available by appointment.

Teaching Assistant Peiyun Zhou: Thursdays 3:00 pm – 5:00 pm in Dr. Cromley’s lab

Email: [pzhou5@illinois.edu](mailto:pzhou5@illinois.edu)

#### Course Description (from Graduate Catalogue):

Emphasis on educational research applications of regression with special emphasis placed on application and interpretation of techniques. Topics covered include rudimentary linear algebra, the general linear model, different coding schemes, regression diagnostics, and extensions to binary data and nested data structures.

**Course Outline**

This course is designed to introduce future researchers and practitioners to details of regression analyses of various sorts, and to continue laying the foundation for advanced methods such as Multilevel/Hierarchical Linear Modeling and Structural Equation Modeling. For example, regression can help answer questions such as

* How do scores on vocabulary, inference, reading strategies, and background knowledge explain reading comprehension?
* Which of these is most important for reading comprehension?
* How much unique variance in reading comprehension is explained by each of those variables?
* How does a new educational intervention affect posttest math scores, after accounting for pretest scores?
* Does that intervention show an effect after covarying students’ ages?
* Do students with higher spatial scores gain more from an intervention than those with low spatial scores?
* How do prior achievement and motivation variables predict staying in vs. dropping out of a science major?

and many, many other questions. The emphasis for this course is on understanding appropriate uses and the common misuses of various regression approaches, interpreting and reporting results correctly in APA style, not on memorization.

**What I expect from you:**

You will engage in six types of activities to build your understanding in this course:

1. Textbook and other readings (1-2 hrs./Week.)
2. Coming to class **with a laptop that has SPSS** if at all possible and a calculator (a simple one that can square and take square roots is fine),and doing exercises that accompany the lecture. **Please check Blackboard for new postings at least twice a week.** The course is listed on Compass 2g/Blackboard as Applied Regression Analysis(3 hrs./Week.)
3. Completing statistical analysis homework assignments (3-6 hrs./Week.)
4. Completing article homework assignments (1-2 hrs./Week.)
5. Preparing for and taking periodic online quizzes and in-class paper tests (1-2 hrs./Week.)
6. Practicing applying statistical concepts taught in the class, such as in your lab/work, end-of-chapter problems, etc. (1-2 hours/week)

These activities all reinforce each other. If you expect to learn this material well and succeed in this class, you will need to budget *at least* 9 hours per week for this course. **Most of your learning will take place out of class meetings.** Only 3 hours/Week are lecture; you need to spend at least twice that amount of time studying outside of class. Practice in using and interpreting statistics is key to learning and understanding it. Unlike most math-related classes you have taken, memorization will only occasionally be helpful. I expect you to apply what you learn; this means doing some thinking on your own, not just going through a series a steps that I give you.

“Learning is not something that happens to students;

it is something that happens by students,” (Zimmerman, 1989, p. 21).

**What you should expect from us:**

1. We will be in the office for office hours, and you can schedule other times to meet in person or via Skype or some other type of video conference if you can't make it to in-person office hours.
2. We will answer email promptly, usually within 2 hours but always within 24 hours. We will answer questions to clarify a topic, help with homework, or other questions or obstacles to your learning.
3. We will post clarifications or hints to Blackboard if students are having difficulty (or had difficulty) with an assignment or assessment.
4. We will return on-time assignments to you by the next class session. You should keep all graded assignments (except for the midterm and final exams, which I need to keep—we can schedule meetings to review them).
5. We will grade assignments with a high level of attention to detail. Some of you will be carrying out analyses at some point in your career that can have very serious consequences (e.g., trials of therapy techniques for suicidal patients).
6. We will also be humane in our grading; if no one in the class answered a question correctly, then we did not teach it well and we will take responsibility for that.

**Course objectives:**

At the end of this course, with the aim of becoming a better consumer and user of educational statistics, students will be able to:

1. Using the SPSS computer program (pull-down menus and syntax), conduct simple linear and multiple linear regression on a data set.
2. Accurately screen the data for assumptions of normality, linearity, homoscedasticity, lack of multicollinearity, and outliers.
3. Using SPSS, partition the variance in the DV using an approach that is appropriate to the research question.
4. Using SPSS, conduct logistic and multinomial logistic regressions.
5. Given a data set and a research question, choose the appropriate type of regression to apply.
6. Be able to identify common errors made when conducting and interpreting the above-mentioned statistical tests.
7. Be able to interpret the results and report full results of the above tests in APA style in text and tables.
8. Be familiar with matrix representations, matrix multiplication, and inversion for regression, in order to lay a foundation for future coursework.

**Text, readings, and software:**

One textbook for the course is available as an e-book from the university library: Pardoe, I. (2012). *Applied Regression Modeling, 2nd Edition*, Baltimore, MD: Wiley. ISBN: 978-1-118-09728-1, list price for the print book is $124.95 (often available from online retailers at a discounted price) and for the ebook is $99.95. Other editions of the same text will be fine.

The second textbook for the course is Warner, R. M. (2008). *Applied Statistics: From Bivariate Through Multivariate Techniques (1st Ed.).* Thousand Oaks, CA: Sage. ISBN: 978-0761927723. This book should be available used from multiple online retailers, typically at a cost of $2-$20. I have also placed the physical book on reserve at the library.

Other required readings are found on the university electronic reserves site for the course; log in at reserves.library.illinois.edu

You must have access to SPSS software. This software is available for $70 from the UIUC web store; the license will expire August 1st.

**Access to computers:**

This course **requires** access to the following computer resources

*Blackboard*—access via the Internet from home; a good Internet connection is necessary for taking quizzes and replaying recorded lectures (the free Google Chrome browser is recommended). A poor Internet connection is no excuse for poor performance.

*SPSS*—a license purchased from UIUC web store and downloaded onto your own computer or use SPSS in the library’s Scholarly Commons http://www.library.illinois.edu/datagis/faqs.html

A *printer* if you wish to print PowerPoints, handouts, etc.

#### Class Attendance and Participation

Students should attend each class and participate in in-class exercises. Course content, instruction in using software, and other material that is not in the assigned readings will be covered in class. There are no specific requirements for participation.

I will record every class lecture using the microphones located throughout the classroom and post the MP4 recording via the class Blackboard site using a program called Camtasia. **You may download videos to your own computer; you may not post or share them (or any part of them) with anyone outside of class.** If you do not want your voice on the recording, feel free to hand me a written down question. If you have question, chances are other students do as well. Please don’t let anything get in the way of asking!

**Students with Disabilities:**

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or e-mail a message to disability@uiuc.edu.

To insure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class are asked to see the instructor as soon as possible.

**Academic Integrity:**

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: http://education.illinois.edu/edpsy/about/academic-integrity. Please note that you are responsible for reading this policy. Ignorance is not an excuse for any academic dishonesty. Plagiarism or fair use violations will be dealt with without exceptions. http://education.illinois.edu/edpsy/academicintegrity. Students may work on the **second** draft of a homework assignment together, but absolutely no cutting and pasting (i.e., verbatim copying) is allowed. Working together on a **second** draft also means that you may not “share” the work of locating articles for the article assignment; any pair of students submitting the same article on more than one assignment will be presumed to have violated this rule.

The Illinois Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://www.admin.uiuc.edu/policy/code/

**Evaluation:**

Student grades will be earned by students’ achievement on the following assignments. Please see the weekly schedule for due dates:

Statistical analysis homework assignments (6 x 5% ea.) 30%

Completing article homework assignments (5 x 1% ea.) 5%

Quizzes ([7 minus 1 dropped] x 1.67% ea.) 10%

Midterm examination 32%

Final examination 23%

TOTAL 100%

*No Extra Credit:*

Your course grades are based only on the above information. There will be no extra-credit opportunities. Please do not ask for exceptions.

#### Assignments

**1) Statistical analysis homework assignments (6 x 5% ea.).**

The goal of these assignments is to help you understand different regression techniques by carrying them out on data sets that are posted on Blackboard; all homeworks for the semester are in one large Word file on Blackboard. Homework must be typed (**or neatly handwritten)** and submitted at the beginning of class. **Please pay close attention to detail when you are answering questions.** Please attach all relevant parts of the output (printing in small format is encouraged), and be sure to open the SPSS Notes boxes (I will explain this in class). Unless prior arrangements are made, 5% of the grade for that assignment will be deducted for each day assignments are submitted late; the “day” begins at 9:00 am on Tuesday (see pages 7-8 for the deadlines).

In order to encourage mastery of the material, if you wish to revise an SPSS homework assignment based on my comments, you may do so **by giving me the revision within one week of receiving feedback from me**. Your grade will be based on the best score of the two submissions—original and revised. In my experience, students who receive a poor grade almost invariably neglected to revise homework assignments.

If you have not used Blackboard before for your courses, helpful information will be found at <https://www.cites.illinois.edu/illinoiscompass/studentresources.html>

Optional online computation exercises (0%)

The goal of these assignments is to help you practice calculations that you may need to be able to do, and do quickly, on quizzes and exams. These are completed online so that you can get immediate feedback. They have open and close dates keyed to the quiz on which the content is covered; I can re-open them for midterm and final exam studying on request.

2) Completing article homework assignments (5 x 1% ea.)

The goal of these assignments is to help you, in small steps, learn how to critically read some of the regression results in published journal articles in your field. All of these homeworks must be submitted by 9:00 am on the respective Tuesday (see pages 7-8 for the deadlines). **Please be sure to attach the article itself.** Article homework assignments **may not be revised for a higher grade**. Unless prior arrangements are made, 5% of the grade will be deducted for each day assignments are submitted late; the “day” begins at 9:00 am of the due date.

3) Quizzes (completed by dates shown on pp. 7-8; ([7 minus 1 dropped] x 1.67% ea.)

There will be a quiz lasting about 15 minutes shortly before every other class session (approximately). Each quiz will consist of 4-6 questions of 1-2 points each for a total of 6 points, to be completed before class meets. You may use a printed or handwritten crib sheet with notes of up to two sides of one 8½” x 11” sheet of paper. Please have a calculator handy for quizzes. I will supply online any needed tables or other handouts. No other papers, books, electronic, Internet, help from classmates, or other resources are permitted to be used for taking quizzes. Each timed quiz will “open” on Blackboard two days (12 noon) after the material is covered\*, and will close at lecture start time on the quiz completion date (for example, the quiz to be completed for 1/26 can be begun any time between Thursday 1/21 at 12 noon and Tuesday 1/26 at 9:00 a.m.). The quiz must be completed in a single session that ends by clicking the Submit button (never use the back arrow on your browser, and do not close your browser in the middle of a quiz), and no makeup quizzes are permitted. A major goal of the quizzes is to help you figure out what you know and what you still need to study more (to become more metacognitive about statistics). Please email me immediately if your computer crashes or you get any error message that leads you to believe your quiz answers were not recorded. For your own protection and for study purposes, please print your quiz before you click on “Submit.”

4) Midterm (3/15; 32%) and Final (5/10; 23%) Examinations

There will be an in-class midterm examination (3 hours) on 3/15 covering all topics up to this date, including the first class meeting. You may use a crib sheet with notes of up to 2 sides each on four 8½” x 11” sheets of paper. Please have a calculator available for exams. I will supply any needed tables or other handouts. No other papers, books, or resources are permitted on exams other than blank scratch paper.

There will be an in-class final examination (3 hours) on 5/10. The final covers all topics since the midterm (and topics from before the midterm implicitly). You may use a crib sheet with notes of up to 2 sides each on two 8½” x 11” sheets of paper. Please have a calculator available for exams. I will supply any needed tables or other handouts. No other papers, books, or resources are permitted on exams other than blank scratch paper. A special grading rule is in place for the final exam—raw scores of less than 66.6% on the final exam will earn a grade of F for the final.

**Important Regulations**

Students are responsible for all information transmitted in the classroom. This includes lecture material that may or may not be included in the readings, announcements about deadlines or changes of deadlines, meeting course requirements, etc.

No makeup tests will be given without written documentation, e.g., a note from a physician on her/his letterhead.

Submission of all course requirements must be made on paper in person to the course instructor (unless otherwise noted on the assignment itself).

Please notify me in advance if any assignment deadlines conflict with a religious observance.

\*The one exception is the matrix algebra quiz, which will open the morning after the midterm exam.

**Grades will be earned according to the following system**

97-100 = A+ 93-96.9 = A 90-92.9 = A-

87-89.9 = B+ 83-86.9 = B 80-82.9 = B-

77-79.9 = C+ 73-76.9 = C 70-72.9 = C-

#### 67-69.9 = D+ 63-66.9 = D 60-62.9 = D- Below 59.9 = F

# Weekly Schedule

| Date | Topic | Readings to complete before class (more may be added) | Assignments due by 9:00 am of the date |
| --- | --- | --- | --- |
| 1/19/2016  Week 1 | PPt1: Introduction  Correlation and regression | None | None |
| 1/26/2016  Week 2 | PPt2: Multiple regression  (pull-downs and syntax), part and partial correlation | Pardoe Ch. 2 & 3 through 3.3.5 and 3.5  🍸 Hinkle et al., 1998, pp. 502-505 | Quiz 1  (On material from Week 1)  Optional HW1 |
| 2/2/2016  Week 3 | PPt3: Assumptions of regression | Pardoe Ch 3, Section 3.4 and Ch. 5 through section 5.2.3 | HW1 (on Weeks 1-2)  Article assignment A  Optional HW2 |
| 2/9/2016  Week 4 | PPt4: Hierarchical regression/ commonality analysis | Warner Ch. 14 (esp. pp. 560-569)  and Nathans et al. | Quiz 2  (On material from Weeks 2-3)  Optional HW3 |
| 2/16/2016  Week 5 | PPt5: Categorical predictors: Dummy and effect coding, relation to ANOVA | Pardoe Ch 4, Section 4.3 | ***HW2--Will require extra time***  (on Weeks 3-4)  Article assignment B  Optional HW4 |
| 2/23/2016  Week 6 | PPt6: Interactions, Centering, & testing change in *R*2 , CI around regression line, adjusted *R*2 | Pardoe Ch 4, Section 4.2 | Quiz 3  (On material from Weeks 4-5)  Optional HW5 |
| 3/1/2016  Week 7 | PPt7: ANCOVA | Warner Ch 15 | HW3 (on Weeks 5-6)  Article assignment C  Optional HW6 |
| 3/8/2016  Week 8 | PPt8: Midterm exam review  Bring your crib sheet  Regression in matrix algebra  **3/11 deadline to drop via self service** | Pedhazur Ch. 6 and Appendix A | Quiz 4  (On material from Weeks 6-7)  Optional HW7  (Sample ANCOVA avail.) |
| 3/15/2016  Week 9 | Midterm exam  **3/15** **Deadline to drop without grade of W** | Midterm exam | Midterm exam |
| 3/22/2016 | SPRING | BREAK | NO CLASS |
| 3/29/2016  Week 10 | PPt9: Curvilinear regression | Warner Ch. 14 (esp. pp. 549 and 574) | Quiz 5 (Opens 3/16;  On material from Week 8)  Optional HW8 |
| 4/5/2016  Week 11 | PPt10: Logistic regression | Warner Ch 21 (pp. 931-961) | HW 4 (on Week 10)  Article assignment D  Optional HW9 |
| 4/12/2016  Week 12 | PPt11: Multinomial logistic regression | Warner Ch 21 (pp. 961-974) | Quiz 6  (On Weeks 10-11)  Optional HW10 |
| 4/19/2016  Week 13 | PPt12: Introduction to SEM | Keith Ch 10 | HW 5 (on Weeks 11-12)  Article assignment E |
| 4/26/2016  Week 14 | PPt13: Introduction to HLM | T&F Ch. 15, pp. 781-806 | Quiz 7  (On Weeks 12-13)  Optional HW11 |
| 5/3/2016  Week 15 | PPt14: Final exam review  Bring your crib sheet | None—Final exam review | HW 6 (on Weeks 13-14)  Optional HW12  (Sample HLM avail.) |
| 5/10/2016  9:00-11:50 AM  Tentative  date and time  Week 16 | Final exam  Stay alert for announcements regarding the confirmed final exam date, time, and location | Final exam | Final exam (On  weeks 10-14) |