INEG 5393 – Applied Regression Analysis for Engineers

Draper and Smith (1998), *Applied Regression Analysis*

http://www.wiley.com/WileyCDA/WileyTitle/productCd-0471170828.html

1. Fitting a Straight Line
2. Checking the Straight Line Fit
3. Special Topics

5. The General Regression Situation
6. Extra Sums of Squares
7. Serial Correlation in the Residuals
8. More on Checking Fitted Models

11. On Worthwhile Regressions and R^2
12. Polynomial Models
13. Transformation of the Response Variable
14. Dummy Variables

I6. [Centering and Scaling, Multicollinearity]

ISYS 5623 Multivariate Analysis
Walton College of Business
University of Arkansas
Spring 2012

Instructor: Fred Davis
Information Systems Department
BADM 216, 575-5980
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Description: Applications of statistical techniques and analysis of business and economic research. For students in business and economics without regard to fields of specialization. Prerequisite: ISYS 5203.

Value of the Course: This course is particularly appropriate for preparing doctoral students to conduct behavioral and social science research in Information Systems and related business disciplines. Primary emphasis is on regression analysis, with some coverage of factor analysis. The class emphasizes practical application of modeling and data analysis techniques, and involves extensive hands-on experience with realistic data sets. Students should bring laptops to each class.

Course Objectives: After completing this course, students should be able to:

-formulate and test regression models
-interpret regression estimates and hypothesis tests
-perform regression diagnostics
-conduct and interpret exploratory factor analysis
-test and interpret mediation and moderation
-know when and how to use non-linear, logistic, multilevel, and longitudinal regression

Required Textbook and Software: Cohen, Cohen, West & Aiken "Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences" (3rd edition); SPSS.

Preparation: Before each class, you are expected to read and study the assigned chapter and do assigned (ungraded) homework assignments. You should be prepared to present and discuss your homework in class.

Grading

Midterm 1	30%
Midterm 2 (take home)	30%
Final (in class)	40%

Inclement Weather Policy: Class will be cancelled only if the University announces cancellation of classes. Information about University closings can be obtained by calling 575-7000 or 575-2000, by checking the University web site, or by listening to KUAF 93.1 FM.
Academic Honesty: Cheating will not be tolerated. If academic dishonesty is suspected, it will be reported to the judicial coordinator and to the All University Judicial Board, when appropriate.
Accommodations for Students with Disabilities: Students with disabilities must register with the University Center for Educational Access. Please meet with me individually and we will work within the university and college policies.

ISYS 5623 Multivariate Analysis
Walton College of Business
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Spring 2012

Jan 19 Ch 1. Intro & Ch 2. Simple Regression

Jan 26 Ch 3. Multiple Regression

Feb 2 Ch 4. Assumption Checking

Feb 9 Ch 5. Data Analytic Strategies

Feb 16 Factor Analysis (read Costello & Osborne 2005

Feb 23 Exam 1

Mar 1 Ch. 7 Interactions Among Continuous Variables

Mar 8 Ch. 8 Categorical or Nominal Independent Variables

Mar 15 Ch. 9 Interactions with Categorical Variables

Mar 22 Spring Break

Mar 29 Ch. 12 Causal Models

Apr 4 Ch. 10 Outliers and Multicollinearity

Apr 12 Exam 2 due (take-home) Ch. 13 Logistic Regression

Apr 19 Ch 14 Random Coefficient and Multilevel Models

Apr 26 Ch. 15 Longitudinal Regression Models

May 3 Review

May 10 ? Final Exam

ISYS 5723, FALL 2014
ADVANCED MULTIVARIATE ANALYSIS

INSTRUCTOR

Viswanath Venkatesh
Distinguished Professor and Billingsley Chair
Phone: 479-575-3869
Email: vvenkatesh@walton.uark.edu
Web site: http://vvenkatesh.com
Office hours: By appointment

MEETING TIME

Monday, 10 a.m. to 12:50 p.m.
Note that individual sessions are scheduled on different days/times to accommodate guest speakers (if applicable) or, in rare instances, the professor's competing academic priorities.

COURSE OVERVIEW

Data analysis is often the key to the discovery of interesting storylines that can lead to publishable papers, especially at the premier journals. Often, such discoveries require understanding the data and applying the appropriate technique(s). Because there are numerous techniques in the world out there, it is impossible to discuss all of them. So, we will focus on a few commonly used techniques in the field of business management and the skills necessary to pursue discoveries using these alternative techniques. Data analysis is only learned by actually doing it. So, the class will feature several opportunities to work on data sets, including your own.

MATERIALS

Two primary types of articles will be assigned throughout the semester: ones that explain how to apply a technique and exemplars that apply a technique (students are welcome to suggest articles, especially of the latter variety).

Examples and demos will be shown primarily using SPSS. Students are welcome to use SPSS, SAS, Stata or any other software. Software packages vary greatly in their ability to conduct complex analyses—this will be part of the learning experience!

Although the instructor will provide data sets for illustrations and assignments, you are strongly encouraged to work on your data sets—this will greatly help in fortifying concepts.

COURSE OBJECTIVES

After this course, students will be able to:

1. Understand the appropriate use of various advanced multivariate techniques; and
2. Apply the various techniques to data sets.

COURSE STRUCTURE AND CONDUCT

Class sessions will include a combination of the discussion of conceptual foundations of different techniques and their actual application to data sets (including hands-on in-class activities). Students should read the assigned readings prior to class meetings in order to

maximally benefit from the meetings. However, given the complexity of the techniques, it is understandable if the student doesn't "get it" prior to class—yet, using this as an excuse to not do the readings will disadvantage the student.

Given that this is an advanced course, it is expected that students will take the initiative on various aspects of the course, including working with data on their own. Also, tool support and tool discussion will be minimal—once again, students will be expected to explore on their own and figure out solutions.

DELIVERABLES AND GRADING

The deliverables focus on examining how well students understand the conceptual foundations of the techniques and students' ability to learn, understand and apply the techniques to data sets. The deliverables are:

(i) Weekly assignments (25%): There will be weekly assignments due—often they will build on an in-class exercise. These assignments will typically focus on data analysis and interpretation of results.

(ii) Exams (40%; 20% each): Each exam will be closed-book and closed-notes. It will comprise two multi-part questions that focus on one or more of the following: conceptual foundations, analysis, and interpretation.

(iii) Presentation of other techniques (10%): Students should present a brief overview of an advanced analysis technique. Students should meet the instructor to discuss the technique by 10/9.

(iv) Paper and presentation (20% and 5%): Each student can choose his or her own (or borrowed) dataset to thoroughly analyze using the various techniques discussed in this course (other advanced techniques can also be used—instructor approval necessary). The paper must report the results of the main analyses, associated interpretation and tell an interesting story. Students who use data sets other than their own (or those who use jointly owned datasets) must disclose data ownership details and consent from data owners/co-owners. The instructor's decision is final with regard to suitability of a dataset for the paper/presentation. More details on the paper/presentation will be discussed as the semester progresses. Students should start working on this early to maximally benefit from this experience. [More on this later in this section]

Presentations of Other Techniques

The objective of this exercise is to begin the lifelong journey of learning new analysis techniques. This also presents other students an opportunity to learn new techniques. Three new techniques are multilevel moderated mediation, non-linear indirect effects and quadratic mediation.

Presentation structure

The presentation (duration and whether this will be an individual or team exercise will be determined by the number of students enrolled) should focus on:

a) Conditions when the technique can be used.
b) Overview of the technique.
c) Illustration of the use of the technique from a published paper.

It is important to use this opportunity to learn a new technique (perhaps something that will help you in the future) rather than simply recycle something you have learned/used previously.

Paper and Presentation
The objective of the paper and presentation are to learn how to use one or more techniques in the context of a data set.

Paper structure
a) Overview of the topic: A 1-2 page (succinct) summary of the topic, prior research and the scientific gap you are seeking to address.
b) Description of the data structure: List the constructs, provide a conceptual definition, and discussion of the measurement.
c) Discuss all the analysis conducted with justification for various decisions (e.g., modeling constructs) and interpretation of the results.
d) Identify which set of results you choose to tell your "interesting story." Tell your interesting story in 1-2 pages.

Presentation structure
The presentation (duration will be determined by the number of students enrolled) will be an abstract of your paper and should focus on:
d) Topic, prior literature, and gap.
e) Analyses run (overview).
f) Detailed results related to your chosen "interesting story."
g) Summary of the "interesting story."

GRADES
Grading of different components will vary between objective (conceptual foundations, analysis, and interpretation) to subjective ("interesting story"). Meeting expectations for any deliverable will earn a B (80-89). Exceeding expectations will receive an A (90-100). C or worse will mean the work must be re-done for a maximum score of 80. Overall, this means if you meet expectations throughout, you will receive a B. You must exceed expectations to receive an A in this course. Getting a C or worse in any one component of the course will automatically result in the best possible grade that the student can receive to be a B.

ACADEMIC INTEGRITY
The issue of academic integrity has been discussed above but is reiterated below for the broad context of the course as well. A key excerpt from the Provost's website regarding academic integrity is shown below:
As a core part of its mission, the University of Arkansas provides students with the opportunity to further their educational goals through programs of study and research in an environment that promotes freedom of inquiry and academic responsibility. Accomplishing this mission is only possible when intellectual honesty and individual integrity prevail.

Each University of Arkansas student is required to be familiar with and abide by the University's 'Academic Integrity Policy' which may be found at provost.uark.edu/academicintegrity. Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor.

All activities and deliverables in this course are governed by the principles of academic integrity. Here are some *examples*: (1) assignments should be done individually; (2) paper and related

analyses should reflect your individual work (input, wherever obtained, from sources outside the class should be disclosed); and (3) synergies with other work (e.g., for the two presentations), while encouraged, should be discussed with and approved by the instructor—the primary focus here will be that sufficient unique work is being performed in the context of this course.

EDUCATIONAL ACCESS

The Center for Educational Access (CEA) serves as the central campus resource for helping students with disabilities obtain the accommodations they need for equal access to classroom activity. The CEA provides direct support for students with disabilities and training and educational resources to the University community as a whole. Additional information regarding accommodations and other related matters can be obtained directly from CEA (http://cea.uark.edu/). If you have any questions, please contact the instructor.

OTHER ISSUES

The professor's discretion applies and his decision is final in the case of any issues not directly discussed in the syllabus. This course and its practices will follow and be compliant with various university policies, especially those related to academic integrity (familiarize yourself with the Provost's new policy on this), inclement weather and students with disabilities. In the case of the need to schedule an alternate time to take the exam, extenuating circumstances (the undergraduate catalog provides some examples) and significant academic conflicts will be the only ones considered.

TENTATIVE SCHEDULE

The schedule and topics are subject to change at the professor's discretion depending on various factors including student progress.

Session, date	**Topics**
1, 8/25	Review: Basic multivariate concepts (e.g., terms, OLS assumptions)
9/1	No class—Labor day
2, 9/8	PCA and factor analysis + review of mediation, moderation
3, 9/15	Polynomial regression analysis
4, 9/22	2SLS, 3SLS, SUR, GEE, Logit, Probit, WLS, PLS
5, 9/29	2SLS, 3SLS, SUR, GEE, Logit, Probit, WLS, PLS (continued)
6, 10/6	2SLS, 3SLS, SUR, GEE, Logit, Probit, WLS, PLS (continued)
7, 10/13	Midterm exam
10/20	Fall break
8, 10/27	Reflective, formative, 2nd order, index
9, 11/3	Mediated-moderation, moderated-mediation
10, 11/10	HLM 1 (to include pre-class webcast)
11, TBD	HLM 2
12, 11/17	Student presentations of alternative techniques
13, 11/24	Presentations and final exam review
12/1	Replaced with session on HLM 2
14, TBD	Per exam schedule/student preferences
	Paper due: TBD (default: 11:59pm on the day of exam)

PLSC 5913: Research Methods in Political Science

Fall 2014

Instructor: Geoboo Song, Ph.D.
Department of Political Science
University of Arkansas
Old Main 437, Fayetteville, AR 72701
Phone: 405.595.8019
Email: gbsong@uark.edu

Teaching Assistant: Rachael Moyer
Department of Political Science
University of Arkansas
Phone: 870.421.5350
Email: rmoyer@email.uark.edu

Classroom: Old Main 204

Class Time: Tuesdays, 6:00 PM – 8:30 PM

Course Website: learn.uark.edu; Facebook *Research Methods Group*

Office Hours: 10:30 AM – 11:30 AM, Tuesday and by appointment

Course Overview: This course is designed to provide first semester graduate students of political science and public policy (or the social sciences more generally) with a firm foundation in, and an ability to apply, some of the most commonly used research methods for empirical analysis of political science and public policy theories. The course will also provide a broad working knowledge of *Stata* (www.stata.com), a data analysis and statistical software.

The course consists of three parts. Part One of the course will focus on the foundations of scientific reasoning and how to incorporate such reasoning into designing political science research. Part Two will concentrate upon the fundamentals of statistical inference, which will coincide with exploration of the class datasets. Finally, Part Three will discuss Ordinary Least Squares (OLS) regression, one of the most widely used statistical techniques for empirical politics and policy research, including analysis of its assumptions and where they are most likely to fail. In addition, strategies for appropriate modeling when the assumptions of OLS fail will be explored.

Upon successful completion of the course, you are expected to be conversant with – and capable of using – some of the most widely used basic statistical techniques for empirical studies of politics and policy.

Prerequisites: Graduate standing. It is assumed that you can recall college algebra, and that a short "refresher" will restore your familiarity of basic calculus and geometry. I will depend on you to be sure that you have the basic understanding necessary to succeed in this class. If you are missing important background knowledge, let me know, and I will suggest ways to acquire it.

In-Class Data Analysis: This class is designed to get your hands "dirty" with real data analysis as rapidly as possible. To accomplish this, I will provide you with in-class datasets and codebooks. These data will be made available on the course website at the appropriate time and will provide the basis for application of the statistical techniques covered in the class, using the statistical modules in Stata.

Statistics Laboratory: Occasional statistics labs, focusing on the use of Stata, will be held. Timing and content of the labs will be announced.

Class Exams: An important part of this class will be learning to conduct accurate and concise empirical analysis, which will be emphasized in the take-home exams. The requirements for each exam will be discussed more fully in class. One exam will be administered at the end of each major segment of the course, for a total of three exams.

Homework Assignments: Homework exercises focusing on specific topics of each seminar will be assigned and graded on a regular basis, and will be discussed in subsequent sessions. Exercise problems and datasets will be made available on the course website at the appropriate time. You should submit your work by no later than the beginning of the subsequent class meeting – work can be submitted electronically on the course website (learn.uark.edu). Answer keys, when appropriate, will be posted on the course website at the appropriate time.

Class Format, Procedures & Grading: This class will consist of a mix of lectures, seminar-type discussions and workshops. Analyses using Stata will occasionally be conducted jointly in class. The lab sessions will concentrate on review of statistical applications and the use of Stata. The analyses in class and lab sessions will employ the data sets provided for this class. Performance in the course will be evaluated on the basis of three exams, homework assignments, and class participation. The grade will be evaluated as follows:

Exam 1: Research Design	20%
Exam 2: Statistical Inference	20%
Exam 3: Regression and Diagnostics	20%
Homework Assignments	20%
Class Participation (in-class discussion)	20%

As noted above, exams will be of the take-home variety, some of which require that you actually analyze data provided as part of the exam. I strictly enforce the University of Arkansas Honor Code

(see below). It is presumed that you will regularly attend class – the pace of the class will be rapid and it will prove extremely difficult to catch up should you fall behind.

Academic Honesty: Students who engage in cheating, plagiarism and other forms of academic dishonesty are subject to disciplinary penalties, including the possibility of course failure and even dismissal from the university. Please consult the University of Arkansas's Provost and Vice Chancellor for Academic Affairs' "Academic Integrity at the University of Arkansas" website (http://provost.uark.edu/245.php). In particular, you should be sure to review the Student Handbook or the University Graduate Catalog for more information.

Inclement Weather Policy: In the event of extremely hazardous conditions, the University may announce that the inclement weather policy is in effect. You may call 575-7000 after 5:00 a.m. for announcements. Announcements are also made on the KAUF Radio (91.3 FM) as well as local radio and television stations. Students should be aware that this policy applies to University offices and support services and is not related to the schedule of classes. Students should consult directly with the instructor about this class.

Emergency Procedures: Many types of emergencies can occur on campus; instructions for specific emergencies such as severe weather, active shooter, or fire can be found at emergency.uark.edu

Severe Weather (Tornado Warning):

- Follow the directions of the instructor or emergency personnel
- Seek shelter in the basement or interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building
- Stay in the center of the room, away from exterior walls, windows, and doors

Violence/Active Shooter (CADD):

- **C**all – 9-1-1
- **A**void – If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **D**eny – Barricade the door with desk, chairs, bookcases or any items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it's safe.
- **D**efend – Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

Disabilities: University of Arkansas Academic Policy Series 1520.10 requires that students with disabilities be provided reasonable accommodations to ensure their equal access to course content. If you have a documented disability and require accommodations, please contact me privately at the beginning of the semester to make arrangements for necessary classroom adjustments. Please note, you must first verify your eligibility for these through the Center for Educational Access (contact 479.575.3104 or visit http://cea.uark.edu for more information on registration procedures).

Copyrights: Please note that all handouts and supplements used in this course are copyrighted. This includes all materials generated for this class, including but not limited to syllabi, exams, in-class materials, review sheets, and lecture outlines. Materials may be downloaded or photocopied for personal use only, and may not be given or sold to other individuals.

Required Texts:

Bulmer, M.G. 1979. *Principles of Statistics*. Mineola, NY: Dover Publications.

King, Gary, Robert O. Keohane, and Sidney Verba. 1994. *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Princeton, NJ: Princeton University Press.

Pollock, Philip H. 2011. *The Essentials of Political Analysis, 4th Edition + A Stata Companion to Political Analysis, 2nd Edition package*, Washington D.C.: CQ Press.

Recommended Texts:

Fox, John. 2008. *Applied Regression Analysis and Generalized Linear Models*, *2nd Edition*, Thousand Oaks, CA: Sage Publications, Inc.

Gujarati, Damodar. N. 2003. *Basic Econometrics, 4th Edition*, New York: McGraw-Hill.

Greene, William. H. 2007. *Econometric Analysis, 7th Edition*, Upper Saddle River, NJ: Prentice Hall.

Tentative Schedule of Topics:

Week 1 (August 26): Introduction to the Class

Week 2 (September 2): Introduction to Empirical Studies of Politics and Policy

- Almond, G. A. 1988. "Separate Tables: Schools and Sects in Political Science." *PS: Political Science and Politics* 21(4): 828-842.
- Almond, G. A. and Stephen J. G. 1977. "Clouds, Clocks, and the Study of Politics." *World Politics* 29(4): 489-522. (Optional)

- Holden, M. 2000. "The Competence of Political Science: Progress in Political Research Revisited." *American Political Science Review* 94(1): 1-19.
- Gunnell, J. G. 2005. "Political Science on the Cusp: Rediscovering a Discipline's Past." *American Political Science Review* 99(4): 597-610. (Optional)
- DeLeon, P. 1998. "Introduction: The Evidentiary Base For Policy Analysis: Empiricist Versus Post Positivist Positions." *Policy Studies Journal* 26(1): 109-113.
- Garand, J. D. 2005. "Integration and Fragmentation in Political Science: Exploring Patterns of Scholarly Communication in a Divided Discipline." *Journal of Politics* 67(4): 979-1005.

Week 3 (September 9): Fundamentals of Research Design

- KKV: Ch. 1-3
- Pollock: Introduction & Ch. 4
- Mackie, J. L. 1965. "Causes and Conditions." *American Philosophical Quarterly* 2(4): 45-64. (Optional)

Week 4 (September 16): Research Design (continued)

- KKV: Ch. 4-6
- Campbell, D. T. and Stanley, J. C. 1963. *Experimental and Quasi-Experimental Designs for Research*. Chicago: Rand McNally.

Week 5 (September 23): Measurement & Data Collection

- Pollock: Ch. 1 & Ch. 2 (pp. 28-32)
- Stevens, S.S. 1946. "On the Theory of Scales of Measurement." *Science* 103(2684): 677-680.

Week 6 (September 30): Exam 1

Week 7 (October 7): Math Refresher for Political Scientists

- Gill, J. 2006. *Essential Mathematics for Political and Social Research.* New York: Cambridge University Press.

Week 8 (October 14): Exploring Data – Descriptive Statistics & Graphing

- Pollock: Ch. 2 (pp. 33-44)
- Kastellec, J. P., and Eduardo L. 2007. "Using Graphs Instead of Tables to Improve the Presentation of Empirical Results in Political Science." *Perspectives on Politics* 5(4): 755-771.
- Gelman, A. 2012. "Why Tables Are Really Much Better Than Graphs." *Journal of Computational and Graphical Statistics* 20(1): 3-7.

Week 9 (October 21): Foundations of Statistical Inference

- Bulmer: Ch. 1-4 & 6-7
- Pollock: Ch. 6

Week 10 (October 28): Statistical Inference & Hypotheses Testing

- Bulmer: Ch. 9-10
- Pollock: Ch. 7 (pp. 155-169)

Week 11 (November 4): Measures of Association

- Pollock: Ch. 7 (pp. 169-177) & Ch. 8 (pp. 182-187)

Week 12 (November 11): Exam 2

Week 13 (November 18): Linear Regression

- Pollock: Ch. 8 (pp. 187-206)
- Lewis-Beck, M., and Skalaban, A. 1990. "The R-Squared: Some Straight Talk." *The Political Analysis* 2(1): 153-171.
- Achen, C. H. 1990. "What Does "Explained Variance" Explain?: Reply." *The Political Analysis* 2(1): 173-184.
- Bramber, B., Clark, W.R., and Golder, M. 2006. "Understanding Interaction Models: Improving Empirical Analyses." *Political Analysis* 14(1): 63-82.

Week 14 (December 2): Regression Diagnostics

- Berry, W. D. 1993. *Understanding Regression Assumptions*. Sage Publications, Inc.
- Downs, G. and Rocke, D. 1979. "Interpreting Heteroskedasticity." *American Journal of Political Science* 23(4): 816-828.
- Lemieux, P.H. 1978. "A Note on the Detection of Multicollinearity." *American Journal of Political Science* 22(1): 183-186.

Week 15 (December 9): Logistic Regression & Concluding Remarks

- Pollock: Ch. 9-10
- Beauchamp, T.L. 1982. *Ethical Issues in Social Science Research*. Johns Hopkins University Press.

Week 16 (December 16): Exam 3

SOCI 5313
Advanced Data Analysis
Old Main 324
Office Hrs. MW 8:00-9:30

Dr. Fitzpatrick
Old Main 231
575-3777
kfitzpa@uark.edu

COURSE OUTLINE

This course is designed to introduce you to statistical techniques that can be applicable to you in your current "occupation" or future professional careers. While there will be some attention paid to understanding the theoretical/abstract application of statistics and data analysis, the focus of this course will be on **application and interpretation**. It is unlikely that any of you have a desire to become a statistician--and working from that assumption, I will try to concentrate on the practical issues of statistics and data analysis and what it can do for you.

My plans are to start off with some basic statistical concepts that you should already be familiar with, gradually gaining speed and sophistication in technique and interpretation. The following pages detail the requirements, expectations, and outline of the topics I plan to cover.

Some specific goals for the course:

1) To increase your knowledge of multivariate statistics and data analysis strategies.
2) To strengthen your ability to ask the right research questions and develop the appropriate analytical strategy for answering those questions.
3) To promote critical thinking and problem-solving strategies.
4) To expose you to a wide range of data analysis techniques and statistical methods currently being used in the social sciences, specifically sociology.

COURSE REQUIREMENTS

1) Each student is required to attend all classes. Attendance is **required** for all exams, labs, and the day that homework is due. If you miss any of the required work, the only excuse I am likely to accept will be from a licensed physician. You can expect that I would be skeptical of most other excuses since I've heard them all over the last 30 years in the classroom. There are obvious exceptions to this rule but they are very limited.
2) Each student will be required to take two in-class exams. None are cumulative. Each one is worth 100 points. There is no final exam for this class.
3) Each student must bring a calculator to class every day and know how to work it. Don't get something too complicated—other than the usual functions all you really need is the square root function.

GRADING

Your grade in this course will be based on the following: two in-class exams (100 points each); homework assignments (approximately 10 @ 20 points each); and your attendance/class participation. Your final grade will be based on the proportion of points earned of the total possible points. **NOTE: Only a written medical excuse will be accepted for missing any class, exam, or homework!**

COMMUNICATION REQUIREMENTS

All students must have an active UARK email account. As a class, we will be using this as our **primary** mode of communication. I check email routinely and I expect that you would do the same. Please note that emails that I distribute to the class using the email list from ISIS SHOULD NOT be used to contact students, request class notes, sell or distribute spam email.

ACADEMIC MISCONDUCT

Please refer to the student handbook for a clear set of definitions, explanations, and consequences. You may also go to the following website for more in-depth discussion about plagiarism and other forms of misconduct: http://owl.english.purdue.edu/handouts/research/r_plagiar.html http://www.indiana.edu/~wts/wts/plagiarism.html I take this serious and so should you. Your work is meant to be independent. If you need help, seek out Wendie or myself. Copying work from a classmate is considered cheating—don't do it. Even if I don't catch you, it will likely impact your ability to do independent work. This also applies to asking more senior graduate students for their work. While they may give it to you and you might improve your grade—it won't help you during your exams.

CLASSROOM EXPECTATIONS

So as to avoid any misunderstanding about what I expect from you in the classroom, let me SPELL it out for you. I expect you to be early or on time (not 5 minutes late). We need to hold one another accountable to this. Don't show up late. It's rude to the professor and to fellow students who have managed to get here on time. Turn off your phones, beepers, and any other electronic device that is deemed to be a distraction. While in the classroom, I would expect your full attention and not be sharing it with the person sitting next to you, the newspaper, your dreams, twitterdom or facebook world.

WEATHER AND RELIGIOUS HOLIDAYS

If Fayetteville Public Schools announce they are closed or will be closing, our class may still NOT be cancelled. Listen to what the university is planning to do, if they make no official announcement we will have class. You should expect that we would always have this class unless you hear from me differently (another reason to check/read your email). Either way, we will make up the class if we miss because of weather on an agreed upon day prior to the next scheduled class meeting.

Most Christian religious holidays are reflected in the organization of our academic calendar, holidays of other religious groups are not. If you need to be excused from class for religious reasons, you are expected to provide me a schedule of religious holidays that you intend to observe (and miss class) in writing during the first week of class.

READINGS

1. SPSS 20.0 (or an earlier version) Base for Windows User's Guide: SPSS Inc. 2012. **(Recommended)**

2. SPSS Survival Manual, Julie Pallant 3rd Ed. McGraw-Hill 2005. **(Required)**

3. SOCI 5313 Readings 2014. (**Required and on Blackboard)**

4. Naked Statistics 2013. Wheelan, Charles. New York: Norton. (**Recommended**)

These are required readings. The first one (SPSS Survival Manual) is in the bookstore and can be ordered elsewhere on-line. The second one (Readings) will be provided for you via Blackboard. These readings are meant to help you complete your understanding of a concept. While I do not specifically test from them, I would expect that you are reading them as we move through the materials each week. These readings will not only able you have a more complete understanding but also help with examples and illustrations. The book that is listed as #4 is meant to be a supplement but I highly recommend picking this book up and reading it as we move along. Even a chapter or two each week will help you refamilarize with some important concepts that you might not have been exposed to in an earlier course.

COURSE FORMAT AND REQUIREMENTS

This course is designed to review the skills that you picked up in a basic statistics class, while at the same time, adding to your growing repertoire of interpretative and analytical skills. The lectures are designed around specific topics and serve as a theoretical/conceptual introduction. After we spend time familiarizing you with each technique, that week will be devoted to working on SPSS exercises using the techniques and interpreting substantive results.

The requirements of this class will be as follows:
1) Two Exams (In-Class)
2) Homework Projects (Probably Weekly)
3) Class Presentation/Discussion

REMINDERS:
The homework must be typed and completed by the beginning of every class. I do not want your **SPSS output jammed into the back of this homework**. You will need to import it into Word or some other word processing package and edit it so that it is a seamless part of your homework document.

In addition to the assigned homework and exams, each student will be responsible for doing the assigned reading in preparation for each class. Students will be assigned one week in which they will be the designated "expert" on the reading. This means that students will be prepared to provide an overview and some insight from the readings as it applies to the discussion in class for that week. A one-page double-sided outline must be prepared to handout to the class and a brief discussion of the week's topics should be covered.

This grading and the requirements are subject to change at the discretion of the instructor.

LABS

In addition to the lecture on Tuesdays, you will be required to attend a one-hour lab on Wednesdays. The purpose of the lab will be two-fold. One, to address any remedial issues that develop over the course of the week. Two, to assist you with your assignments, navigating SPSS, and using your community of students to work through problems and issues that arise each week. Betsy O'Connor will be your lab instructor. She will be available on Thursdays before lab and during lab to help you with any problems that might arise. In addition to your attendance, there will be regularly assigned activities for you to complete in lab that **will be graded**. In addition to the lab time, it is VERY important that you familiarize yourself with SPSS and its data management capabilities as much as possible—handouts and exercises will be provided and Betsy and I will be available during our office hours to help answer your questions.

TOPICS AND READINGS

WEEK 1/2

COURSE OVERVIEW
Introduction(s)
Course Expectations
The Social Science Research Process
Statistic's Role in Empirical Research--What about Theory??
Using SPSS to get answers

Reading:

1) SPSS 20.0 Base (or some earlier version) Review Introductory Chapters

2) SPSS Survival Manual: pps.1-30; 52-90 (Black dot #s upper corner)

CHAPTER 10 IN CLASS DISCUSSION WEEK 2 (pps. 91-110)

3) SOCI 5313 Readings #1

WEEK 3/4

ANALYSIS OF VARIANCE

Oneway ANOVA
Twoway and Multiway ANOVA
Statistical Interaction and the Analysis of Variance

Reading:

1) SOCI 5313 Readings #2

- Fitzpatrick, Kevin and John Logan. 1985. "The Aging of the Suburbs 1960-1980." ***American Sociological Review*** *50*:106-117.

2) SPSS Survival Manual pps. 169-200; 201-208

WEEK 5/6

BIVARIATE CORRELATION AND LINEAR REGRESSION

Bivariate Correlation (Pearson's r)
The General Linear Model
Fitting the Regression Line
Ordinary Least Squares Regression

Reading:

1) SOCI 5313 Readings #3

- Fitzpatrick, Kevin and B. Piko, D. Wright, and M. Lagory. 2005. "Depressive Symptomatology, Exposure to Violence, and the of Social Capital among African-American Adolescents." ***American Journal of Orthopsychiatry*** 75: 262-274.

2) SPSS Survival Manual pps. 110-130

WEEK 7/8 **MULTIPLE REGRESSION AND ITS ASSUMPTIONS**

Assumptions of the Linear Model
Significance Testing (Equations and Individual Coefficients)
Unstandardized versus Standardized Regression Coefficients
Diagnosing Fit--Am I doing a good job of predicting Y??

Reading: 1) SOCI 5313 Readings #4

- Fitzpatrick, Kevin M. 1997. Fighting Among America's Youth: A Risk and Protective Factors Approach. ***Journal of Health and Social Behavior***, 38:131-148.

2) SPSS Survival Manual pps. 135-151

WEEK 9 **EXAM 1**

WEEK 10 **SPECIAL TOPICS AND PROBLEMS WITH REGRESSION**

Dummy Variable Regression
Testing for Interaction Effects
Diagnostics for and Problems with OLS

Reading: 1) SOCI 5313 Readings #5

- Fitzpatrick, Kevin M. and Janet Boldizar. 1993. The Prevalence and Consequences of Exposure to Violence among African-American Youth. ***Journal of the Academy of Child and Adolescent Psychiatry,*** 32: 424-430.

WEEK 11 SPRING BREAK

WEEK 12 **FACTOR ANALYSIS**

Assumptions
Extension of the Linear Model
Problems & Solutions

Reading: 1) SOCI 5313 Readings #6

- Darrell Steffensmeier, Jeffery T. Ulmer, Ben Feldmeyer and Casey T. Harris. 2010. Scope And Conceptual Issues In Testing The Race–Crime Invariance Thesis: Black, White, And Hispanic Comparisons. ***Criminology***, 48:1133-1169.

2) SPSS Survival Manual pps 152-167

WEEK 13/14 **CAUSAL MODELING**

Causal Assumptions
Cause versus Correlation
Path Analysis (Recursive Models)
Direct and Indirect Effects (Effects Analysis)

Reading: 1) SOCI 5313 Readings #7

- Fitzpatrick, Kevin M. and William Yoels. 1992. Policy, School Structure, and Sociodemographic Effects on Statewide High School Dropout Rates. ***Sociology of Education***, 65: 76-93.

WEEK 15 **NONLINEAR REGRESSION APPLICATIONS**

OLS Assumptions Violated?
Different Dependent Variables
Logistic Regression

Reading: 1) SOCI 5313 Readings #8

- Fitzpatrick, Kevin M. 1999. Violent Victimization Among America's School Children. ***Journal of Interpersonal Violence***,14:1055-1069.

WEEK 16 **EXAM 2**

STAT 4001L
Statistical Methods Lab
Fall 2014
Course Syllabus

Instructor : Luis Ek

Office : Champions Hall 322 (the new building next to physics)

E-mail : luisek@uark.edu

Office Hours : By appointment on Mondays

Reference Book :

Learning SAS in the Computer Lab, Rebecca J. Elliott and Christopher H. Morell

Lab Times :

Group 1 will meet in SCEN 320 from 12:30pm - 1:20pm every Tuesday.
Group 2 will meet at 12:55pm-1:45pm every Wednesday.

Course Description :

Emphasis on the use of integrated statistical packages (Statistical Analysis System) to complement statistical methodology being covered concurrently in STAT 4003.

Goals :

The course aims at giving you a solid preparation on the use of SAS, one of the most advance and widely used statisitcal programming packages currently available.
Upon successful completion of the course, you will be familiar with the SAS programming, data analysis procedures using SAS and more importantly interpretation of result

Assessment :

There will be no quizzes/test/Exams in this course. Instead homework assignmnet will be used for assessment and grading. Assignments will be given every week and you will be expected to turn in:

- The **hard copy of your SAS output** at the beginning of the next lab meeting.
- **SAS code** used in the homework assignment. This should be sent to your instructor via email before the beginning of the next lab meeting. No late assignment will be accepted.

Whereas students are encourage to discuss among themselves the material present in the class, the homework solutions MUST be on your own!

Academic Honesty :
see UA academic Policies

Grades :
Grading Scale: A=90-100%, B= 80-89.9% , C=70-79.9% , D=60-69.9% F=0-59.9%

Course Outline :
This class can be broken into 3 main parts

1. Basic SAS Prrogramming: Inputing data, cleaning it and printing it .
2. Descriptive Statistics and numerical measures: Measures of centre, variation, tables and graphs
3. Statistical Inference: Condifence intervals, Hypothesis Testing (z-test,t-test, anova,regression, correlation)

Pre-requisites :
Taking or have taken a basic statistics course such as STAT 4003. No programming skills are required.

Computer Misuse :
Internet surfing **during** the lab hour will **NOT** be tolerated

Attendance :
Students are expected to be on class at all times and turn in the completed exercise to the instructor. No make-up labs/assignments etc. *If you miss a class you are responsible for all materials you missed. If you can't make it to class due to some reason, you can email me your assignment*

Statistics 4003 (Statistical Methods)
MWF 10:45 AM – 11:35 AM (SCEN 610)

Instructor: Dr. Avishek Chakraborty (email: **ac032@uark.edu)**

Office hours: Wednesday 1:00 PM–2:45 PM in SCEN 315 and other times by appointment. These times are subject to change.

Prerequisites: Calculus 1.

In this course we will learn necessary formulas for data analysis. You do not need to derive the formulas but you have to apply them to solve the problems from your homework, quiz and exam.

Syllabus: (broadly**)** Descriptive Statistics, Concepts of probability, sampling, regression and experimental design. A tentative list of topics is provided later.

Grades:

15%	Homework	A	90.00 - 100%
5%	Class quizzes	B	80.00 – 89.99%
20%	Midterm 1 (In class)	C	70.00 – 79.99%
20%	Midterm 2 (In class)	D	60.00 – 69.99%
40%	Final exam (In class)	F	0 – 59.99%

Quizzes:

- During the semester there will be 6 class quizzes, they will be announced the week before.
- Each quiz will have 2-3 problems and you will be given 10 minutes to solve.
- I will drop your lowest quiz grade.

Homework:

- Unless otherwise specified, homework will be posted Friday afternoon and will be due by **Wednesday 5:40 PM** of the following week**.**
- To get grade for a homework problem, you need to present complete solution of the problem and not just the answer.
- I will drop your lowest homework grade**.**

The students are encouraged to discuss among themselves about course materials and concepts but the homework, quiz and exam solutions must be your own work.

Study Plan:

- I will be discussing the key concepts and provide examples in the class. It is important to be present in the class, take notes and go through them after the class.
- I will also be posting notes summarizing the topics that I have taught in the class before. These notes are useful to understand the key concepts and to solve problems.

- You need to use a calculator to do the problems in class, quizzes, homework and exams.

- This course will NOT use software for exams/homework/quiz. All computations in this course will be performed using the calculator. The STAT 4001L lab course will teach you how to solve those problems using SAS, but you do not need that for this course.

- **Textbook:** The course materials will be entirely covered through my class lectures and notes. For supplemental reading, you may use the book: Introduction to Probability and Statistics, 13th Edition by Mendenhall, Beaver, and Beaver. You are not required to buy this or any other book. It is the student's responsibility to take notes of class discussion. If you cannot attend a lecture, please make sure to take the class notes from other students.

Summary of topics

Describing Data, Basic Probability, Random variables, Normal Distributions, Binomial distributions, Sampling Distributions, Confidence Intervals, Hypothesis testing, Correlation and Regression, Contingency table, Experimental Design, ANOVA, Comparing two populations

NOTE: This is only a ***tentative list of topics***. I may alter the order and length of time spent on any particular topic to accommodate this particular class of students.

Attendance: Examples of absences that should be considered excusable include those resulting from the following: 1) illness of the student, 2) serious illness or death of a member of the student's immediate family or other family crisis, 3) University-sponsored activities for which the student's attendance is required by virtue of scholarship or leadership/participation responsibilities, 4) religious observances (see UA Religious Observances policy below), 5) jury duty or subpoena for court appearance, and 6) military duty. You are responsible to collect the course material that has been covered during your period of absence. If you miss any exam or quiz due to an excused absence, you are required to contact the instructor within 24 hours of joining the class to reschedule it.

ACADEMIC INTEGRITY: "As a core part of its mission, the University of Arkansas provides students with the opportunity to further their educational goals through programs of study and research in an environment that promotes freedom of inquiry and academic responsibility. Accomplishing this mission is only possible when intellectual honesty and individual integrity prevail." Each University of Arkansas student is required to be familiar with and abide by the University's Academic Integrity Policy which may be found at http://provost.uark.edu/. Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor.

ACCOMMODATIONS: Under University policy and federal and state law, students with documented disabilities are entitled to reasonable accommodations to ensure the student has an equal opportunity to perform in class. If you have such a disability and need special academic accommodations, please report to Center for Educational Access (CEA). Reasonable accommodations may be arranged after CEA has verified your disability.

INCLEMENT WEATHER POLICY: The instructor will make every effort to hold class whenever the University is open. If you feel that travel is too hazardous due to weather conditions, inform your instructor by email. Students will not be penalized for being absent on days the Fayetteville Public Schools are closed due to weather. However, as with any absence, all are responsible for any missed material. If the university is officially closed, class is canceled.

STAT 4373: Experimental Design

Spring 2015

General Information:

Class hours:	MWF 9:40–10:30
Class location:	JBHT 234
Webpage:	`http://definetti.uark.edu/~gpetris/stat4373`
Instructor:	Giovanni Petris, *GPetris@uark.edu*
Office:	SCEN 314
Office Hours:	Monday 3:00–4:00pm, Thursday 2:00–3:20pm, or by appointment.

Text: Box, Hunter and Hunter (2005), *Statistics for experimenters* (2nd ed.).

Note on the book: I will follow the book quite closely. You are expected to have read the material of the day before I go over it in class. As such, the purpose of my lectures is to review, and to highlight some of the more important but less obvious issues. Following and understanding the lectures is necessary but not sufficient for understanding the material. The best way for that is to do more problems from the book.

Computing: We will be using the statistical computing environment R. You will need to know some R in advance, but you will learn more during the course. Consult the course web page for R material.

Learning outcomes: Upon successful completion of the course, students will be able to:

- Design experiments to address problems that are important to scientists, engineers, and other quantitative researchers.
- Construct appropriate statistical models to form the framework for analyzing the resulting data.
- Find point and interval estimates for model parameters, and test hypotheses about them.
- Assess model fit and validity of assumptions.
- Suggest remedial measures or alternative analyses when assumptions are not met.
- Use computer software to carry out the analyses.

Topics covered: (Please note that the following is a tentative list, subject to change)

- Introduction: review of probability and statistics, introduction to the statistical computing environment R.
- Comparing two means.
- Comparing k means.
- Factorial designs.
- Fractional factorial designs.
- Multiple sources of variation: split-plot designs; variance components.
- Response surface methods.

Assessment: Your final grade will be based on three in-class midterm examinations, one final exam, and homework assignments. The midterm exams, as well as the final, will be closed book and closed notes. However, you may have one side of a 8.5x11-inch page of hand-written notes for each midterm, and two sides of a 8.5x11-inch page of hand-written notes for the final. Bring a calculator to the exams, but not a computer or any other internet-accessing device. Homework assignments will be posted on the course web page on a regular basis. You may discuss an assignment with other students but the written solution to homework problems must be your own, reflecting your understanding of the problems and of their solutions. On homework and tests, provide details in your solution, not just an answer. An answer, even a correct one, will not get credit if there is no accompanying explanation/derivation.

Course grade: The course grade is equally divided between homework, midterms, and final exam.

Prerequisites: Statistical methods (STAT 4003).

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Statistics 5313 (Regression Analysis)
MWF 10:45 AM – 11:35 AM (Kimple Hall 0210)

Instructor: Dr. Avishek Chakraborty (email: **ac032@uark.edu)**

Office hours: Wednesday 1:00 PM–3:15 PM in SCEN 315 and other times by appointment. These times are subject to change.

Prerequisites: The course lectures will assume students have a background in Statistics, Probability distributions and Matrix algebra. For statistics, the students are expected to know the concepts and methods at the level of STAT 4003. For probability, they should be familiar with commonly used probability distributions. Another very important requirement is prior experience with matrix algebra. Almost every lecture of this course will use matrix notations and topics that depend on knowledge of inverse, determinant, eigenvalues and eigenvectors, rank, quadratic forms, partitioned matrices. I will be reviewing these concepts in the first week or so but if you are not familiar with them, it will take additional effort to be comfortable using them. For those students who are looking for a course to increase their familiarity with matrix-based methods, I strongly recommend attending STAT 4353 Numerical Linear Algebra.

Syllabus: (broadly**)** Review of matrix algebra, simple and multiple linear regressions, aspects of regression diagnostics, variable selection, generalized linear model, Bayesian inference, nonparametric regression.

Note: This is only a *tentative* list of topics. I may alter the length and time spent on any particular topic or add any new topic to accommodate this particular class of students.

Grades: The grading system for this course will follow the weights and cutoffs mentioned in the following table. No additional grading opportunity will be provided to any student under any circumstances.

30%	Homework	A	90.00 - 100%
15%	Midterm 1	B	80.00 – 89.99%
20%	Midterm 2	C	70.00 – 79.99%
35%	Final exam	D	60.00 – 69.99%
		F	0 – 59.99%

Homework:

- Unless otherwise specified, homework will be posted Friday afternoon and will be due by **Wednesday 5:40 PM** of the following week**.**
- To get grade for a homework problem, you need to present complete solution of the problem and not just the answer.
- I will drop your lowest homework grade**.**

The students are encouraged to discuss among themselves about course materials and concepts but the homework and exam solutions must be your own work.

Study Plan:

- I will be discussing the key concepts, methods and provide examples in the class. It is important to be present in the class, take notes and go through them after the class.

- In this course, you will learn how to implement the methods using R. Your homework will involve data analysis in R.

- Having said that, this is Not a computation-only course. This course will develop the modeling and concepts related to regression analysis in a rigorous way. I will discuss the theory for relevant results and your homework and exams will involve theoretical problems as well. Hence, to do well in this course, you need to be comfortable with theoretical details and computational aspects.

- **Textbook:** The course materials will be entirely covered through my class lectures. Those of you who prefer to look at a book to understand the concepts better, you may use the book: Introduction to Linear Regression Analysis, 5th Edition by Montgomery, Peck and Vining. Some of the matrix algebra details can be found in the book: Linear Models in Statistics, 2nd Edition by Rencher and Schaalje. You are NOT required to buy these books or any other book. In my lecture and for assigning homework, I shall not assume you have this book and shall develop everything on its own. These books may not cover all the topics that I plan to teach. I will frequently use materials from external resources whenever appropriate. Hence, you should use the book only in addition to my lecture notes. It is the student's responsibility to take notes of class discussion. If you cannot attend a lecture, please make sure to take the class notes from other students.

Attendance: Examples of absences that should be considered excusable include those resulting from the following: 1) illness of the student, 2) serious illness or death of a member of the student's immediate family or other family crisis, 3) University-sponsored activities for which the student's attendance is required by virtue of scholarship or leadership/participation responsibilities, 4) religious observances (see UA Religious Observances policy below), 5) jury duty or subpoena for court appearance, and 6) military duty. You are responsible to collect the course material that has been covered during your period of absence. If you miss any exam or quiz due to an excused absence, you are required to contact the instructor within 24 hours of joining the class to reschedule it.

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STAT 5353: Multivariate Analysis

Fall 2012

General Information:

Class hours:	MWF 1:30–2:20
Class location:	MAIN 203
Webpage:	`http://definetti.uark.edu/~gpetris/stat5353`
Instructor:	Giovanni Petris, *GPetris@uark.edu*
Office:	SCEN 314
Office Hours:	Friday 2:30-3:20pm, or by appointment.

Text: Izenman (2008), *Modern Multivariate Statistical Techniques*.

Objectives: The course will introduce you to the fundamental techniques of modern multivariate analysis. While covering also traditional topics, I will emphasize whenever possible techniques and algorithms relevant to modern applications in data-rich environments, where it is not uncommon to deal with data sets that include thousands of variables and/or observations.

Assessment: Your final grade will be based on three in-class midterm examinations, one final exam, and homework assignments. The midterm exams will be closed book and closed notes. Homework assignments will be posted on the course web page on a regular basis. You may discuss an assignment with other students but the written solution to homework problems must be your own and not copied from someone else.

Course grade: The course grade is equally divided between homework, midterms, and final exam.

Outline syllabus:

- Random vectors and matrices; the multivariate Gaussian distribution, Wishart distribution; parameter estimation for a multivariate Gaussian sample.
- Multivariate linear regression.
- Principal component analysis.
- Canonical variates and correlation analysis.
- Linear discriminant analysis.
- Cluster analysis.
- Multidimensional scaling.
- Factor analysis.
- Correspondence analysis.
- Support vector machines (if time permits).
- Tree-based methods (if time permits).
- Committee machines (if time permits).

Software: We will use the statistical computing environment R. The web site `http://www.r-project.org` contains a wealth of information about R, including documentation and instructions to download and install the program on your computer (it is free!!).

Prerequisites: I will assume that you are familiar with the most important univariate distributions (e.g., Gaussian, gamma, binomial) and the main notions of statistics (e.g., estimators, standard errors, bias, mean square error, hypothesis testing), including linear regression. Moreover, in the course we will rely heavily on the notation and language of linear algebra, to which you are assumed to have been exposed. Finally, you are responsible for reviewing – or learning – the basics of R.

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