

Psychology 612 Syllabus
Advanced Statistics and Research Methods in Psychology II
Spring, 2003

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Required Textbooks

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. 3rd Edition. Lawrence Erlbaum Associates. ISBN 0-8058-2223-2.

Roger E. Kirk (1995). *Experimental design: Procedures for the Behavioral Sciences*. 3rd Edition. Brooks/Cole Publishing Company. ISBN 0-534-25092-0

Optional Textbook

Kinney, P. R., & Gray, C. D. (2000). *SPSS for Windows Made Simple, Release 10*. East Sussex, UK: Psychology Press Ltd.

Course Overview and Objectives

This course is the second of a two-semester sequence designed to provide you with a strong background in experimental design and statistical techniques common to the behavioral sciences. Together, Psyc 611-612 will provide you with declarative knowledge about:

- various experimental designs and the rationale behind these designs.
- the basic concepts and principles underlying the general linear model (GLM).
- how to critically evaluate research questions and results.
- how to generate “exciting” hypotheses and test theories.

It will also provide you with such procedural knowledge about how to:

- set up your own data to be ready for analysis.
- analyze this data and reach appropriate conclusions.
- test hypotheses and theories using a model-comparison approach
- present your results in APA style.

Some of the topics that will be covered:

- | | |
|--------------------------|---------------------------------|
| * Simple regression | * Multiple comparison tests |
| * Multiple regression | * Completely randomized designs |
| * Best subset regression | * Within-subject designs |
| * Residual Analysis | * Hierarchical designs |
| * Effects coding | * Analysis of covariance |
| * Path Analysis | * Random effects models |
| * Analysis of Variance | * Longitudinal models |

A key focus of this course will be the development of practical, “how-to” skills. Few of you will ever form a research interest in statistics and methods (too bad!), but all of you will have to use or interpret statistics. Thus, the primary emphasis of this course is not to teach you to be statisticians, but rather to teach you how to use different methods and statistics to answer important substantive questions. This means having a conceptual understanding of these issues will be critical.

To help convey the principles stressed in this class, real-world data will be analyzed and interpreted. This will hopefully help you translate the theory of the statistics into practical, real-world value. Thus, you will not only learn about the methods, but also how to actually analyze the data. We will use the same procedures, tactics, and good old intuition and judgment used in practice.

You may have been previously taught that ANOVA and regression are different techniques, to be used for experimental and correlational questions. My goal for this course is to not only to dispel this myth, but also to teach you to understand why this distinction is false and unnecessary (Cronbach noted it as far back as 1957). Regression and ANOVA are both subsumed under the General Linear Model (GLM). Further, ANOVA is a special case of regression. That is why we primarily covered “regression” in 611, and are covering “ANOVA” in 612. But in fact, when we are covering regression we will already be covering ANOVA, and vice versa.

Thus, I have designed this course to be integrative across several useless distinctions: basic and applied research, research and practice, lab and field. I have structured 611-612 so that you will

have a full arsenal of methodological and statistical tools that you can apply to almost any research question you face in the course of your careers. But this class is more than statistics. It is also about how to generate good hypotheses, how to be constructively critical of research, and how to present your findings in APA style. And perhaps most important, by focusing on the building and testing of statistical models, I hope to convey how model building can be used to test theories as well.

Requirements for Master's vs. Doctoral Students

For the most part, the requirements are the same for all students. Everyone attends the same lectures and labs, is responsible for the same material, and takes the same exams. In addition to this, all doctoral students (and M.A. students who choose this option) are required to work under the supervision of their primary research advisor to identify a substantive area of interest, follow-up with their literature review and develop a full-blown research proposal (introduction, proposed methods, etc). Specifically, you will work with your advisor to develop a fully detailed research plan, culminating in a formal research proposal. Note that if you did not participate in the writing assignment for 611, you may not participate in proposal for 612 (unless I approve it in advance). You should use the same advisor as you did for 611, unless you get your advisor to tell me it is acceptable for you to switch.

*The deadline for turning this paper in to your advisor is **May 1**, I must receive your advisor's grade by **May 8**.*

Class & Lab Formats

The regular class meeting will primarily consist of a lecture format. Given the size of this class, it is simply the most efficient means for presenting the material. However, always ask questions if you don't understand something.

Alternatively, the labs will be much more interactive and hands-on. About half of the lab will be lecture, with the remainder consisting of your working on homework assignments using SPSS. Please bring a disk with you to lab each week (you will be saving your data to the disk).

This goes without saying, but make sure you read the assigned text *before* coming to class/labs. A note should also be made about attendance. I expect perfect attendance save for attending scheduled conferences, poor health, or extreme emergencies. Let me know in advance if you are going to be gone, or as soon as possible if you cannot give me advance warning. Please also note that class will start and end promptly, so *show up a few minutes early*. Finally, please do not miss the deadlines—they are real and important!

Course Materials

The course notes will be available via the class website at least one day (and usually one week) before class. It is recommended that you print these out and bring them with you to class. However, not all class material will be posted on the web. Finally, do not print these notes out using lab/department/university paper. These are your notes and just like a course pack, must be purchased by you. Thus, please print them out on a home computer or bring them to a copy center to print out. It is your responsibility to ensure you can get the notes. Accessing the

website is much easier if you use Microsoft Explorer, so please make sure your computer has it (if not, it can be downloaded for free).

Beyond the course notes and textbooks, there will also be several required journal articles and chapters. Articles will be available at the GMU library under the e-reserves, and chapters will be available from the reserves in the Johnson Center. You will need to copy these and return them.

Grades

All grades are based on a straight system: A = 90%+, B = 80%-89%, Failing = 79% & less.

Ph.D. student points (and students completing the literature review) are determined as follows:

Project/Test	[(My Pt. / Tot Pt.) * %]	=	My %
Exam 1 (conceptual; in class)	(_____ / _____) * 16%	=	_____
Exam 2 (conceptual; in class)	(_____ / _____) * 16%	=	_____
Exam 3 (conceptual; in class)	(_____ / _____) * 16%	=	_____
13 Homeworks (can drop 3)	(_____ / _____) * 16%	=	_____
Research Proposal	(_____ / _____) * 15%	=	_____
Lab Participation	(_____ / _____) * 16%	=	_____
6 random quizzes (can drop 1)	(_____ / _____) * 5%	=	_____
Total	100%		_____

Points for all other students are determined as follows:

Project/Test	[(My Pt. / Tot Pt.) * %]	=	My %
Exam 1 (conceptual; in class)	(_____ / _____) * 18%	=	_____
Exam 2 (conceptual; in class)	(_____ / _____) * 18%	=	_____
Exam 3 (conceptual; in class)	(_____ / _____) * 18%	=	_____
13 Homeworks (can drop 3)	(_____ / _____) * 18%	=	_____
Lab Participation	(_____ / _____) * 20%	=	_____
6 random quizzes (can drop 1)	(_____ / _____) * 8%	=	_____
Total	100%		_____

I will always reconsider grades for tests and homeworks. However, before asking me to do so, you must first come prepared by showing me how you are right and my answer was wrong (or at least, how both could be correct). To win these requests, bring page numbers, overheads, etc., so that you can objectively make your case. This is good training for your careers, so you might as well start now! Note that there are no “re-do’s.”

Exams. Exams will be in-class and largely conceptual. They may consist of multiple choice, short answer, and long answer questions. Please make every effort to attend the exam during the regularly scheduled time. If you cannot (e.g., conference), make arrangements with me *before* the exam date. No exams will be given early, and all make-up exams will be essay. If notice is not provided before an exam is missed, no make-up will be given unless sufficient proof is provided for why no prior notice was possible (e.g., hospital form, smashed up car, bringing in the amputated limb, etc). If you miss the exam without prior notice, you have 1 week from the date of the exam to complete the make-up (unless extreme circumstances dictate otherwise).

Homework. Homework will be assigned every week. Homework assignments will be discussed in lab, and will be due the following lab (at the start of lab unless otherwise noted). These assignments will be relatively brief (2-3 hours) and require you to use a combination of SPSS and hand calculations. You will be able to drop 3 of the semester's homework assignments, but only one assignment from between each exam period (the exam periods are shown in the lab schedule below).

Nearly all assignments will also require you to write a brief conclusion section—this must be written in APA style 5.0. **All homework assignments must be typed and stapled; no handwritten homework or computer output will be accepted unless the question specifically requests it** (note that handwritten may refer to using calculators, excel, etc., but you must show your work). If you must miss a lab for a good reason (e.g., conference), labs can be turned in early without penalty. No late homeworks will be accepted (remember, you can drop three). **No homework will be accepted by email!**

Once you have signed up for a lab, you must attend that same lab section for the entire semester. “Switching” labs is not possible, since each lab will be working on their unique data analysis projects.

Note a **new change for 612**—you must **fully complete all homeworks** before they can be potentially dropped. You have to fully complete all homeworks and turn them in on time. Fully completed means completing all parts of the homework, answering all questions, performing all analyses and computations, etc. In short, leaving nothing blank or unanswered. This means that you must do every single homework, but you can still drop three of them. If you don't do a homework, it can not be dropped and will be given zero points. If you make only a weak attempt to do the homework, you will not be able to drop that homework and will receive the appropriate grade. Thus, to drop a homework, all you must do is take it as seriously as any other homework that will not be dropped (i.e., the grading standard is *not* higher or more strict than previously).

Also note that for 612, for Homework 13 you will be giving a brief (12 minute) oral presentation to your lab during one of the last two weeks of the labs. More about the content of these presentations will come later, but for now the important point is this—everyone must do it, and the **presentation can not be dropped**. All presentations are to take place during the last two labs, and you are expected to attend both sessions, even if you are already done presenting.

Quizzes. There will be six quizzes distributed randomly over the course of the class and labs. You can drop one of these quizzes. There will be no advance notice for these quizzes. However, they will be short (about 5 minutes long) and will ask only very basic information. They will be written such that if you have been in class and keeping up with the reading, you should get all of the points without difficulty. All quizzes will be distributed immediately at the start of class or lab. They are designed to make sure the class has been keeping up with readings, lectures, and labs. No make-ups are possible with quizzes, even with advance notice.

Research Proposal. For doctoral students (or any students who wish), you will be writing a research proposal following from your literature review in 611. Your advisor (the same person who read your 611 paper) will read and grade this proposal. You should be working with your

advisor over the course of the semester to develop the content and focus of this proposal. Of course, it **must be in APA style, version 5!** Please turn in a typed and stapled copy for your advisor! Sample copies of exemplary literature reviews will be available for you to review. A list of expectations and criteria for this literature review will be available to you early in the semester. *You must turn in a final draft of your proposal to your advisor by **May 1**; I need the grade from your advisor by **May 8th**.*

Extra Credit. Up to 5 points of extra credit may be obtained by posting answers to the online study guide and practice test. You will receive one point for each answer, so long as you provide a sufficient answer. Note that after an answer has been posted, you can not get credit for answering it. **Yes, this means that this is a first-come first-serve opportunity; it is not guaranteed you will receive these points!** At the end of the semester (no later than the day of the Final Exam), you must email your TA your answers, along with the questions and what date you posted them, and your TA will then apply the points to your lowest exam grade. Thus, these points are potentially worth up to half of an exam letter grade!

Honor Code

This course employs the GMU Honor Code (<http://www.gmu.edu/facstaff/handbook/aD.html>). Working in a group to discuss course materials is encouraged, but all products submitted for this course (unless specifically described as a group project) should represent your own work. That is, all exams, homeworks, and papers are to be written individually. You can work on homeworks as a group if you wish, but the final product must be your own work. Outside sources (e.g., journals, books) may be required to complete some course assignments. Plagiarism is defined as in the APA's "Ethical Principles of Psychologists and Code of Conduct" (<http://www.apa.org/ethics/code.html>) and in the Publication Manual of the American Psychological Association. Taping of lectures is permitted.

Special Help

It is the policy of the University to make reasonable accommodations for qualified individuals with disabilities. Students who may have special needs because of a physical or learning disability are encouraged to contact Disability Support Services ASAP (234 Student Union I) at 993-3247. Students with disabilities who are in need of accommodation relative to class attendance/arrival, course requirements, or related aspects of course performance and who have already processed the necessary paperwork with Disability Support Services must initiate such a request in writing immediately, and prior to any anticipated need, to the instructor. Such requests will be accommodated within the reasonable constraints of fairness and timeliness with regard to the instructor and the other students enrolled in the course.

Therefore, if you have a disability documented by the Disability Support Services Office, which requires special conditions for exams or projects (extended time, large type, etc.), see me the first week of classes.

Tentative 612 Class Schedule

Date	Topic	Chapter/Readings
January 23	Regression with Categorical Predictors; How ANOVA is Regression is the GLM	Cohen 8 & 9 Kirk Chapter 2 (skim) Kirk Chapter 5 Kirk Chapter 6 (pp. 219-239)
January 30	Experimental Research Design	Boruch (1998) Cook & Campbell (1979) Mook (1983) Rosnow (1997)
February 6	Introduction to ANOVA models; Multiple Comparisons	Kirk Chapters 3 & 4
February 13	Completely Randomized Designs	Kirk Chapter 5
February 20	Exam 1	-
February 27	Repeated Measures Designs (Blocking); MANOVA	Kirk Chapter 7
March 6	Multifactor ANOVA models I & II	Kirk Chapters 9 & 10
March 13	Spring Break	-
March 20	Multifactor ANOVA models II; ANCOVA	Cohen Chapter 10 Kirk Chapter 15 Porter & Raudenbush (1987)
March 27	ANCOVA (if necessary); Writing, Publishing, Presenting, and Critiquing Research	Arvey & Campion (1998) Campion (1997) Daft (1995) Schneider (1995)
April 3	Exam 2	-
April 10	Other ANOVA models (hierarchical, confounded, etc)	Kirk Chapters 11, 13, & 14 (read for general understanding)
April 17	Random Coefficient Models Multilevel and Longitudinal Growth Models	Cohen Chapters 14 & 15 Ployhart, Holtz, & Bliese (2002) Rogosa (1995)
April 24	Interviews and more “Qualitative” Research Methods	Maxwell (1998) Van Kammen & Stouthamer-Louber (1998) Eisenhardt (1989)
May 1	Multivariate Methods; Statistics as a Unified Approach Research Proposal Due to Advisor	Bryant & Yarnold (1995) Fabrigar, Wegener, MacCallum, & Grim & Yarnold (1995) Strahan (1999) Russell (2002)
May 8	Final Exam 1:30-4:15 Must Receive Advisor’s Proposal Grade	-

Note: Dates & topics subject to change.

Tentative 612 Lab Schedule

Week of:	Topic	Exam Period	HW Assigned	HW Due
January 23	Categorical Regression and Interactions; Using the GLM in SPSS	1	1	
January 30	Designing Effective Experiments	1	2	1
February 6	ANOVA and multiple comparisons	1	3	2
February 13	Completely Randomized ANOVA (single factor)	1	4	3
February 20	Non-Parametric Statistics	2	5	-
February 27	Repeated Measures ANOVA	2	6	4, 5
March 6	Multifactor ANOVA	2	7	6
March 13	SPRING BREAK	-	-	-
March 20	ANCOVA	2	8	7
March 27	Critiquing and Reviewing Research	3	9	8
April 3	TBA (maybe critique; maybe nested designs)	3	10	-
April 10	“Other” ANOVA Models	3	11	9, 10
April 17	Multilevel Models & Longitudinal Models	3	12	11
April 24	Lab Presentations (can't drop)	3	13	12, 13
May 1	Lab Presentations (can't drop)	3	13	13
May 8	Final Exam 1:30-4:15		-	-

Note: Dates & topics subject to change.

Readings

- Arvey, R. D., & Campion, J. E. (1998). Being there: Writing the highly cited article. *Personnel Psychology, 51*, 845-848.
- Boruch, R. F. (1998). Randomized controlled experiments for evaluation and planning. In L. Bickman & D. J. Rog (Eds.), *Handbook of applied social research methods* (pp. 161-192). Thousand Oaks, CA: Sage.
- Bryant, F. B., & Yarnold, P. R. (1995). Principle components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 99-136). American Psychological Association. Washington, D.C.
- Campion, M. A. (1997). Rules for references: Suggested guidelines for choosing literary citations for research articles in applied psychology. *Personnel Psychology, 50*, 165-167.
- Cook, T. D., & Campbell, D. T. (1979). The conduct of randomized experiments. *Quasi-experimentation: Design and analysis issues for field settings* (pp. 341-386). Boston: Houghton Mifflin.
- Daft, R. L. (1995). Why I recommend that your paper manuscript be rejected and what you can do about it. In L. L. Cummings & P. J. Frost (Eds.), *Publishing in the organizational sciences* (pp. 164-182). Thousand Oaks, CA: Sage
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Research, 14*, 532-550.
- Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*, 272-299.
- Grimm, L. G., & Yarnold, P. R. (1995). Introduction to multivariate statistics. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 1-18). American Psychological Association. Washington, D.C.
- Mook, D. G. (1983). In defense of external invalidity. *American Psychologist, 38*, 379-387.
- Maxwell, J. A. (1998). Designing a qualitative study. In L. Bickman & D. J. Rog (Eds.), *Handbook of applied social research methods* (pp. 69-100). Thousand Oaks, CA: Sage.
- Ployhart, R. E., Holtz, B. C., & Bliese, P. D. (2002). Longitudinal data analysis: Applications of random coefficient modeling to leadership research. *Leadership Quarterly, 13*, 455-486.
- Porter, A. C., & Raudenbush, S. W. (1987). Analysis of covariance: Its model and use in psychological research. *Journal of Counseling Psychology, 34*, 383-392.
- Rogosa, D. (1995). Myths and methods: "Myths about longitudinal research" plus supplemental questions. In J. M. Gottman (Ed.), *The analysis of change* (pp. 3-66). Mahway, NJ: Erlbaum.
- Rosnow, R. L. (1997). Hedgehogs, foxes, and the evolving social contract in psychological science: Ethical challenges and methodological opportunities. *Psychological Methods, 2*, 345-356.

Russell, D. W. (2002). In search of underlying dimensions: The use (and abuse) of factor analysis in *Personality and Social Psychology Bulletin*. *Personality and Social Psychological Bulletin*, 28, 1629-1646.

Schneider, B. (1995). Some propositions about getting research published. In L. L. Cummings & P. J. Frost (Eds.), *Publishing in the organizational sciences* (pp. 216-226). Thousand Oaks, CA: Sage

Van Kammen, W. B., & Stouthamer-Louber, M. (1998). Practical aspects of interview data collection and data management. In L. Bickman & D. J. Rog (Eds.), *Handbook of applied social research methods* (pp. 375-398). Thousand Oaks, CA: Sage.