Psychology 612
Advanced Statistical and Research Methods for Psychology II SPRING 2006

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Class Location:	Robinson Hall B201
Class Date/Time:	Wednesday 8:30-11:10am
WebCT website:	http://webct41.gmu.edu
Class website:	http://mres.gmu.edu/PSYC612/

Teaching Assistants and Lab Details

	Teaching Assistants		
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Section:	**205**	**203**	**201**
Day/Time: **Location:**[b]	R 5-6:50pm 318	R 5-6:50pm 319	W 12:30-2:20pm 328
Section:	**206**	**204**	**202**
Day/Time: **Location:**[b]	R 7-8:50pm 326	R 7-8:50pm 318	W 2:30-4:20pm 333

[a]Office Hours also by appointment
[b]All Lab sections meet in Innovation Hall

Required Textbooks

There are four textbooks required for the course - in addition to the books used from the previous semester for PSCY 611. One (Giere, Bickle, & Mauldin, 2006) provides a general introduction to the logic of scientific and critical inquiry. I hope you'll find the discussion in this text thought-provoking and I trust you will understand the purpose of the book by the end of the semester. The second book (Abelson, 1995) is a text written by an exceptional writer and a fine thinker. He presents statistics in a conceptual manner - eschewing the mathematical details for plain talk about the purpose and use of statistics. The statistical material for the course comes from two books (Grimm & Yarnold, 1995, 2000) that details many statistical procedures. Finally, a book (Sacks, 2003) containing many outstanding science essays supplements the logical, conceptual and practical statistical discussions. These four texts ought to help you learn the language of social science statistics.

Optional Textbooks

Students who struggle with general writing or basic understanding of statistical terminology may benefit from Zinsser (2005) and Gonick and Smith (1993), respectively. I recommend both books for all students since we all struggle with writing and basic concepts. These books present both topics in very easily digestable formats.

Additional Reading

I will provide additional articles for download throughout the semester. These articles are noted in the course outline (see Tentative Schedule below) but there might be relevant but unplanned readings that come to my attention during the course. I will post all additional readings to the course website and send out a note about additional posted articles. I do not anticipate adding much more reading than what is already assigned but be forwarned that it might happen.

Course Overview and General Approach

Psychology 612 is the second of a two-course sequence that serves to introduce psychology graduate students to statistics, research methodology, research design, and measurement. Traditional graduate psychology statistics courses emphasize statistical techniques as a matter of declaritive knowledge. Students are expected to know each procedure and its "appropriate" application. An alternative approach tends toward technical discourse (e.g., matrix algebra, formula memorization, and hand calculations) and requires greater attention to minute detail and mathematical vernacular. My approach will be somewhat different from both the traditional and technical approaches. Instead, I will rely on your verbal skills more than your numerical skills. My aim is to present statistics as principaled argument (Abelson, 1995). Given that statistics is merely a tool of communicating uncertainty, it might be best for students to understand the nature of that uncertainty and how best to communicate that uncertainty to an audience. Therefore, I will cover material that continues your introduction to statistical analysis but emphasize the role of persuasion in all facets of the course. Also, I capitalize on your verbal abilities by shifting the emphasis away from purely mathematical operations to a mixture of both numerical methods and statistical concepts. Writing is an essential part of conceptual understanding so your writing will be reviewed and graded throughout the semester. Understanding concepts and communicating them to others is essential for any aspiring scientist or professional for that matter.

Course Objectives

The purpose of this course is to further your *introduction* to data analysis, research design, and measurement. Your previous semester prepared you well by covering measures of central tendency, measures of dispersion, measures of association, and measures of difference. Due to time constraints, I do not intend to review these terms or their purposes so I urge every student to review that material **prior** to this course. What I do intend to cover is a comprehensive view of statistics - why we use statistics, why you should learn these tools, and what are the most important features to learn and understand. You will gain practical skills in interpreting, applying and explaining statistical procedures. The combination of an interactive lecture and a weekly laboratory will offer each student the opportunity to see the procedures, conduct the procedures yourselves, and then teach one another what you learned. This approach is the common medical model of education - see one, do one, and teach one - that results in better retention and deeper understanding.

Specific Objectives

The primary objective is to familiarize you with the following procedures and analytic approaches. By familiar, I mean that you will be able to identify the key features of each, communicate these features to others, and know when and how to apply them to real data. I organized them below according to general areas related to statistics, research methods, and measurement, however, as you will soon realize, the categories listed in table 1 are not unique and represent fairly arbitrary distinctions.

Procedures:	▷ Regression	▷ ANOVA	▷ GLM
Details:	▷ Predicted	▷ Expected	▷ Residual
Models:	▷ Fixed	▷ Random	▷ Mixed
Designs:	▷ Experiment	▷ Quasi-Experiment	▷ Observation
Complexity:	▷ Univariate	▷ Bivariate	▷ Multivariate
Measurement:	▷ CTT	▷ Rasch	▷ IRT
Approach:	▷ Cross-sectional	▷ Longitudinal	▷ Mixed
Level:	▷ Within	▷ Between	▷ Mixed
Effects:	▷ Direct	▷ Mediation	▷ Moderation
Context:	▷ Discovery vs. Justification		
Process:	▷ Hypothesis Testing vs. Parameter Estimation		

Table 1
Objectives and Terms for Psychology 612.

Grading Criteria

The ideal outcome for the course would be complete mastery of the material and concepts above. For many of you, some of these concepts might seem irrelevant for your field and you may have less interest in those areas. I assure you that every field in social, behavioral, medical and physical sciences applies these concepts. Do not be mislead by your own current understanding of either those terms or your field. I expect everyone to gain at least the ability to identify the key features and clearly state those features. Your grade will be based upon your mastery of these concepts and upon the following three general criteria:

Exams

To evaluate your familiarity with the concepts we cover, I will administer four comprehensive exams throughout the semester - three during the regular semester and one final exam. Each exam will present the concepts covered in class and in the readings. The exams will be a mixture of multiple choice, short response, and essay. All concepts will be covered in sufficient detail so that I can ascertain your level of understanding. I will administer the exams during the first hour of lecture noted in the table below (see Tentative Schedule). Please be sure to mark your calendars and schedule around those dates. Any student who misses an exam will be assigned the lowest grade recorded for that exam. In other words, there are no makeup exams.

Attendance and Participation

I expect all students to attend every lecture and come prepared to discuss the assigned readings. The lecture format will be didactic, interactive, and demonstrative. Attendance will not be taken but your absense will likely result in your failure to grasp certain concepts. Also, failure to participate will only

serve to lessen the utility of the lectures. I encourage everyone to come prepared to each lecture with questions, comments, and interest.

Proposal

Last semester in Psychology 611, Doctoral students completed a literature review. The next step that follows the review is a research project proposal - one that might be suitable for presenting your research ideas to a graduate doctoral or masters thesis committee. The specific guidelines for the proposal will be forthcoming, however, all formatting must comply with the current APA publication style. Proposals are due to your advisors no later than May 1st and grades from your advisors are due no later than May 10th. Please be advised that your advisor must oversee your work on the proposal. I am happpy to assist where statistics and methodology are concerned but first consult your advisor and the course TA's before asking me for specific help.

Lecture Format

I designed the course to maximize productive teaching time and minimize needless distractions. The result of the design is a well-scripted two hours and forty minute lecture period. Each lecture consists of several blocks devoted to a variety of topics. Each block contains a 15-20 minute didactic presentation followed by a 15-20 minute interactive activity. Most lectures will have three and possibly four of these blocks for the entire period. I will post all lecture notes one week prior to the lecture via the course website. The notes outline the aims of the lecture and specify any additional materials required for the lecture. For example, one lecture requires you to bring in candy or other treat. Please comply with these requests for materials - they will help me explain the material better and ensure that you stay actively engaged throughout each lecture and throughout the semester.

Grading

Since the course requires you to learn statistics, I offer you the opportunity to select a grade computation method based upon the statistical principles you learned throughout the semester. The choice of methods are outlined below. Be aware that you must make use of your exam score data and your proposal score to compute your final grade. The general approach requires you to compute your expected score. You may compute this score by using one of the five following methods. It is up to you to decide which one you prefer and to submit to me the value you compute and the grade you dervied from Table 2.

Method 1 - Expected Value at Time 4: Given four exams (three during the semester and one final exam), compute the *expected* score at when time is equal to 4 (i.e., final exam time).

Method 2 - Adjusted Expected Value at baseline: Compute the *expected* score at time 0 (a hypothetical time before the first exam) and subtract from that value $10 * b$ where b is computed from your trajectory.

Method 3 - Expected Vaue: Compute the *expected value* given your four exam scores.

Method 4 - Norm Referenced: Compute the *effect size* between your exam performance and the class exam performance.

Method 5 - Partial Norm Referenced: Compute the effect size between your average exam perfor-mance and the class average exam performance taking into consideration (i.e., *partialling out*) the ex-pected value at the beginning of class.

   Doctoral students completing the proposal ought to weight the computed values above by .8 and the proposal score value by .2 when computing scores. In the latter two methods - you need to weight the scores according to that same method, however, you will need to have a different score reported. I will send out both scores after I receive all proposal scores. Students who do not complete the proposal ought to simply compute the value as described above.

GRADING TABLE

	Method				
GRADE	1	2	3	4	5
A+		97		1.5	
A		92		1.2	
A-		89		.9	
B+		85		.1	
B		82		−.1	
B-		79		−.9	
C		69		−1.2	
D		59		−1.5	
F		0		−∞	

Table 2
*Grading Table: Use this to determine your grade from the methods above. Note the scores are cut scores. To get the grade associated with the score, you must be **above** the cut score.*

   Table 2 provides the cut scores for the values you compute from these methods. If your computed value is *greater than* the value in the column for your method but *less than* the value for the higher grade, the you select the grade assocated with the lower value. For example, suppose I use Method 1 for my grade computation. I compute the expected value at time 4 to be 92. Table 2 shows that the cut score for an "A" is 92 but my score is *NOT* greater than the cut score so my grade is an "A-" based on that logic. I suggest you compute your grade using all the methods and then choose the method that gives you the highest grade. Bear in mind that these computational methods will be abundantly clear at the conclusion of the semester. I do not expect you to understand the methods now. Each student will compute these values at the conclusion of the semester. Students who wish to estimate current performance may compute interim values but bear in mind that any early computations might change dramatically over the semester.

Academic Honesty

   I must state for the record that cheating of any kind will be dealt with by rules set forth in the University Honor Code (see http://www.gmu.edu/catalog/apolicies/index.html). I prefer never to have any academic integrity issue arise during the semester. The aim of graduate education is to learn material that many others have not learned and master this material to ensure your future success. The degree you receive reflects the hard work you put into the coursework. Please do not cheat yourself by misrepresenting your effort. Do the work or accept the grade like an adult. Incidently, nobody ever looks at your graduate grades. Grades are a holdover from your undergraduate years. Spend your effort learning the material and avoid being overly grade conscious. With a concerted effort to learn, you will not be tempted to cheat.

Disability Accomodations

If you are a student with a disability and you need academic accommodations, please see me and contact the Disability Resource Center (DRC) at 703-993-2474. All academic accommodations must be arranged through that office.

Tentative Schedule

The following table outlines the dates, topics, and relevant readings. Please read all the material *prior* to the class date. It is imperative that you read the material before I present so that you can participate and fully appreciate the lecture and class interactive sessions.

Date	Topic	Readings
1/25	Introduction and Critical Inquiry	Chamberlin, 1890[1] Platt (1964)[1] Abelson (1995) c1-5 Giere et al. (2006) c1-4 Grimm and Yarnold (1995) c1 Sacks (2003) p49-67
2/1	Decision Making and Persuasion	Giere et al. (2006) c9-10 Abelson (1995) c6-9 Grimm and Yarnold (1995) c6
2/8	The "GLM"	Grimm and Yarnold (1995) c2 Statsoft GLM[2] Giere et al. (2006) c5-8
2/15	**EXAM 1** MRC	review for exam
2/22	ANOVA	Grimm and Yarnold (1995) c8 Grimm and Yarnold (2000) c10 Bruning and Kintz (n.d.) c4-6
3/1	GLM Variants	Grimm and Yarnold (1995) c7-8
3/8	**EXAM2** Measurement	Grimm and Yarnold (2000) c4 Boorsboom and Mellenbergh (2004) Borgatta and Bohrnstedt (1981) Dawes (1977)
3/15[1]	SPRING BREAK	read ahead and review
3/22	Psychometrics	Grimm and Yarnold (2000) c2-3 Sacks (2003) p138-159
3/29	Alternative Measurement Models	Grimm and Yarnold (2000) c5,6 McArdle (1996) Overall (1964)
4/5	**EXAM3** MRC Details	Freedman (1997) Goertzel (2004) Wendorf (2004)

4/12	ANOVA Details	Statsoft ANOVA[3]
4/19	Models and Designs	Freedman (1991)
		Sacks (2003) p115-122
4/26	The Importance of Variance	TBD
5/1[1]	Proposals DUE	
5/3	Science and Statistics	Sacks (2003) p160-249
5/10[1]	Proposal Grades DUE TODAY	
5/12	**FINAL EXAM** 7:30am-10:15am	

Table 3

: Dates and Topics for Psychology 612. Please note that topics and dates may change due to school closures and unexpected events.

[1]No class on these days, just deadlines you need to remember.
[2]Statsoft GLM discussion can be found here: http://www.statsoft.com/textbook/stglm.html
[3]Statsoft ANOVA discussion can be found here: http://www.statsoft.com/textbook/stvarcom.html

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