

ERM 681: Intermediate Statistical Methods in Education
Tuesday 4-6:50 238 Curry Building
Fall 2006

Professor: Terry Ackerman
Office: 212 Curry Building
Phone: (336) 334-3474 FAX: (336) 256-0405
Office Hours: Tuesday 1:00 to 3:00 and by appointment
Email: taackerm@uncg.edu

Teaching Assistant: David Sunnasee, **Office:** 111A Curry **Hours:** TBD

Course Overview: This advance course covers statistical concepts and methods that can be applied in educational research, behavioral research and other social science research. It will basically cover the last half of the Howell text.

We will begin a brief discussion about the quality of data by examining the concepts of reliability and validity and how to conduct an analysis of item response data. This material will be covered through handouts and is not covered in our text. We then will cover one-way ANOVA (Chapter 11), and the corresponding a priori and post hoc tests (Chapter 12). These concepts will be expanded with factorial analysis of variance (Chapter 13) and repeated measures designs (Chapter 14). Subsequently we will revisit linear regression and talk about research designs in which one has multiple independent (predictor) variables: multiple regression (Chapter 15). In Chapter 15 we will also look at moderating and mediating variables and how they are used in research. Tangentially related to multiple regression is an analysis called hierarchical linear modeling (HLM). Although this is not covered in Howell we will discuss HLM and its applications. We will finish the semester with analysis of covariance (Chapter 16). With some exceptions, we will spend about two classes per chapter.

Finally, you will be expected to become proficient with the Statistical Package for the Social Sciences, **SPSS**, and will be responsible for using this software to carry out assigned homework and examination problems.

Course Objectives:

1. To understand the role of reliability and validity in conducting analyses;
2. To increase your statistical vocabulary and techniques that enable you to become *statistically literate* so that you can interpret, critically evaluate statistical methodology, reported outcomes and inferential interpretations **from research journals in your discipline**;
3. To be able to identify and conduct appropriate statistical procedures for addressing specified educational or behavioral research questions; demonstrate comprehension of the assumptions underlying the use of these procedures, and when needed, be able to select alternative statistical procedures to solve certain research problems;
4. To help you to confidently present and discuss your statistical analyses.

Required text:

Howell, David C. (2002). *Statistical Methods for Psychology*, 5th Edition. Belmont, CA: Duxbury Press.

OR

Howell, David C. (2007). *Statistical Methods for Psychology*, 6th Edition. Belmont, CA: Duxbury Press.

Supplemental texts: (Note these texts are purely optional.)

Morgan, S. E., Reichart, T. & Harrison, T. R. (2002) *From Numbers to Words*, Boston, MA: Allyn and Bacon.

Vogt, W.P. (1999). *Dictionary of Statistics and Methodology*, Thousand Oaks, CA: Sage

Mallery, G. (2005). *SPSS for Windows Step by Step*. Boston, MA: Allyn and Bacon.

Course Requirements:**Homework:**

Homework assignments will consist mainly of problems from the Howell textbook, but on occasion I may substitute questions from other texts. Homework will be graded and returned to you the week after it is received. I will discuss the homework and any misconceptions/errors students may have when I return the homework. There will be six assignments in all, each worth 10 points for a total of 60 points. With such a large class it is very important that you adhere to the following homework guidelines:

- Make sure you **put your name and the exercise set number at the top of your paper.**
- **Highlight your answers.**
- Your homework should have problems (and corresponding solutions) in **numerical order.**
- Whenever possible, **show all of your work. Write only on one side of your paper** so that the TAs can make comments and corrections on the back.
- Sometimes you will be required to repeat the analysis of a problem in **SPSS** on the computer. For problems done on the computer simply **attach a copy of the output and highlight your answers.**
- Due dates will always be specified when the homework is assigned. Homework will be due the week **after it has been covered in lecture.**
- If you are asked to submit sections from a journal article, **attach the first page of the article and the page(s) containing the specific analyses requested. Highlight this portion. Do NOT submit the whole article.**

Exams:

There will be **two exams.**

- Each exam will have two parts: a multiple-choice part and a problem solving part.
- They will both be **“take home” exams.**
- Exam questions will be testing the learning objectives as stated in the handouts.
- Exam I will cover reliability, validity, item analysis and Chapters 11 and 12. It will be passed out on September 19th and will be due a week later on September 26th.

- Exam II will cover Chapters 13, 14 and 15. It will be passed out on November 7th and due on November 14th.
- **Each exam is worth 100 points.**
- **The UNCG Academic Integrity Policy applies for all homework and exams.**

Review Sessions:

One week prior to the midterm exam you will receive a description of what the exam will cover, and a practice exam. I will pass out the answers and go through the practice exam at multiple review sessions.

- Review sessions will be held outside of class and will be scheduled so that everyone will be able to attend at least one session.
- At review sessions I will go over the practice exam, homework, and any other questions students may have.
- Review sessions are not mandatory.

Final Project:

All students must complete a final project which will consist of a PowerPoint class presentation.

- The final project must involve *data from your discipline*
- Each project must involve *at least THREE different analyses that we covered in class.*
- A scoring rubric detailing how the presentations will be graded is attached to this syllabus.
- The final project will also be worth 100 points.
- A one-page proposal of the project must be handed in by **September 19th**.
- I will set up meetings with each person to discuss their proposals shortly after September 19th.
- Project presentations are expected to be in a PowerPoint format and should be about **12-15 minutes in length**. We will begin the presentations on **November 21st** and will end them (if it is ok with everyone) on **December 5th**, which technically is Reading Day.

Grading

Your grade will be determined by your performance on the two exams (200 points total), your project (100 points total) and your exercise sets (60 points total). The total number of possible points is 360. Grades will be assigned as follows:

<u>Point Range</u>	<u>Grade</u>	<u>Point Range</u>	<u>Grade</u>
325-360	A	250-269	B-
305-324	A-	215-249	C
285-304	B+	0-214	F
270-284	B		

Lectures

All lectures will be outlined in PowerPoint format. Starting with the second lecture the PowerPoint slides will be posted on **Blackboard** (<https://blackboard.uncg.edu>) several days before class.

- Students should print out the lecture notes and review them **before** coming to class. They are intended to supplement and help clarify your reading of the chapters.
- **Reading assignments should be done BEFORE class – it will make the lectures more understandable.**

- Occasionally lectures will be broken up to allow time for students to complete **worksheets** that contain examples of analyses being discussed. *Please bring calculators to class to help with the worksheets.*
- Periodically lectures will begin with **short self-tests** as a review of what we covered in the previous class. The self-tests will be short (five to six items long) and cover key concepts that you will be responsible for knowing. We will go through them, discuss them, but they will not be collected. They are intended to serve as a check on your understanding and will provide a good review.
- The School of Education does have laptop computers that we will use in class to review how to do the various analyses in SPSS.
- There will be several computer programs that you will have to download from Blackboard and run as part of your assignments.

Organization

It is extremely important to be organized. I suggest that you purchase a 2 1/2" three-ring binder for your handouts and notes. Organization will facilitate and promote understanding. To help you out all handouts will be holed-punched and will be color-coded as follows:

<u>Handout</u>	<u>Color</u>
Notes, Pretests & pretest answer sheets	White
Example Problems/solutions	Blue
SPSS/computer annotated examples	Yellow
Homework Exercises	Pink
Journal article examples	Green

Study Groups

I encourage you, if it is at all possible, to form your own study groups. Sharing questions and hearing others describe concepts will oftentimes facilitate studying. Explaining or teaching a concept to someone is the one of the best ways to realize what you know and what you don't know. Besides there is the old adage about "misery loves company". Also, you have a great TA. I encourage you to visit or email him whenever you have any questions.

Class attendance

The lectures and in-class discussions will supplement, not duplicate, the material in your textbook. **Attendance is mandatory.** *If you need to miss a class, please let me know ahead of time so arrangements can be made to get you a copy of the handouts etc.*

Asking questions

Whenever something is covered in lecture and you do not clearly understand please do not be afraid to ask for further clarification.

- Sometimes students avoid asking simply because they're lost and feel they don't even know how to phrase a question. All you need to do is just ask me to repeat or clarify and I will be happy to reword or give more examples so that you can understand the material better.
- To facilitate the asking of questions I will pass out a goldenrod colored sheet with blank lines at the beginning of the semester. At the beginning of a class, if you have questions or things are unclear from the previous class, simply write down your question on a goldenrod sheet and leave it on the table at the front of the room. I'll begin the class by answering these questions.

Tentative Schedule ^a

<u>Dates</u>	<u>Topic</u>	<u>Reading Assignment</u>
8/15,22	Introduction, review syllabus, pretest; item analysis, reliability and validity of observed data	Handout
8/29,9/5	Simple analysis of variance, ANOVA, SPSS Simulation software: ANOVASIM.EXE	Ch. 11 (pp. 319-368)^b (pp. 297-336)
9/12,19	Multiple comparisons among treatment means; A Priori comparisons, Post Hoc comparisons 9/19: Submit a one-page project proposal, PASS OUT EXAM I	Ch. 12 (pp. 369-420) (pp. 343-386)
9/26,10/3	Factorial analysis of variance; interactions; Simple effects; power analysis; expected mean squares 9/26: EXAM I IS DUE at the beginning of class	Ch. 13 (pp. 421-470) (pp. 391-434)
10/10	NO CLASS - Fall Break	
10/17,24	Repeated-measures designs	Ch.14 (pp. 471-532) (pp. 439-484)
10/31,11/7	Multiple regression; standard errors and tests of coefficients; partial and semi partial correlations HLM 11/7: PASS OUT EXAM II	Ch. 15 (pp. 533-602) (pp. 493-550)
11/14,21	Analysis of variance and covariance as linear models One-way analysis of covariance; interpretations Presentation of Projects 11/14: EXAM II IS DUE at the beginning of class	Ch. 16 (pp. 603-654) (pp. 555-588)
11/28	Presentation of projects	
12/5	Presentation of Projects (Note: technically this is Reading day, but if there are no objections I'd like to have presentations continue on this day.)	

^aSome topics will require less time than anticipated, others more. If necessary, we will make adjustments during the semester.

^bPages from the 5th Edition of Howell are boldfaced.