Psychology 304B
Fall 2005

Course Information

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Class Time/Location: Lectures, Tuesdays and Thursdays 2:35-3:50, 1431 Stevenson Ctr.
Labs: Wednesday 4:10-5:00 119 Garland

Course Web Site: Blackboard site, listed as 2006.01.SPR.AS.PSY.304B.01 Quant Methods&Exp Design

Course Description

This is the second-semester statistics class for first-year graduate students in the A&S and Peabody Psychology Departments. During this particular year due to the large class enrollment, it is closed to graduate students in other departments with the exception of those students whom I have already granted permission to register. The primary focus of this class will be on variants of what are typically called "ANOVA designs". There will be a set of core issues discussed when covering various designs. We will always be concerned with the conceptual question addressed, the underlying mathematical model, computational procedures, robustness issues (e.g., violations of assumptions and their consequences), focused contrasts as well as overall omnibus tests, the specification of models using statistical software, the meaning of software output, and relations to broader methodological issues (e.g., the relative merits of between- vs. within-subjects designs). This is not a cookbook class and thus a primary goal is arriving at an understanding of the conceptual and mathematical basis for the statistical procedures that you use.

The class will consist of a combination of 75-minute lectures (Tuesdays and Thursdays) and 60-minute laboratory sessions. The lectures will focus on establishing the mathematical, conceptual, and computational basis for the statistical procedures discussed. The main goal of the lab sessions is to give you hands-on experience conducting analyses using statistical software and interpreting the output. In addition,

some lab sessions will be used as a backup in case we fall behind at specific points and need extra time to cover lecture material.

The primary statistical computing platform that we will use will be SAS. We will use SAS in several different ways. First, it will serve as a programming language primarily for demonstration purposes (i.e., typically you won't have to do the programming but will focus primarily on understanding the output). For example, at several points, we will be doing computer simulations that will allow you to gain a hands-on feel for various properties of the statistical procedures that we will be covering. Second, we will use SAS graphics capabilities to display data. Third, and most importantly, we will use SAS statistical procedures to analyze data. In particular, we will rely heavily on PROC GLM (= General Linear Model). You will need access to SAS to do homework assignments. If you do not own SAS or otherwise have access to it, you can use the Stevenson Center computer lab (Room 2200 Stevenson Center) or the Garland Hall computer lab (Room 119 Garland Hall) to perform assignments. Both labs have reasonably liberal hours when no classes are being taught and they are open for use by individuals. I will check on access to computers with SAS on the Peabody campus.

Prerequisites:
A grade of B or better in Psychology and Human Development 310 (the fall term predecessor to this class) or the permission of the instructor.

Reading Materials:
There is one book that is available at the Vanderbilt Bookstore under Psychology 304B: Maxwell, S.E., & Delaney, H.D. (2004). *Designing Experiments and Analyzing Data: A Model Comparison Perspective* (2nd Ed.). Mahwah, NJ: Erlbaum.
Likely, the readings that you will find most helpful are handouts (typically pdf files) that can be downloaded from the class web site.

Grading:
There will be regular (typically weekly) homework assignments. In addition, there will be one midterm and a final exam. All exams will be take-home. Each of the three components (homeworks, midterm, final) will count 1/3 toward your final grade.

Tentative Schedule (Readings from Maxwell & Delaney, available handouts, and other materials that you can download will be listed and available on the class web site):

Week 1:

Lecture 1 (R 1/12)	Introduction to Class/ χ^2, and F distributions/tests on variances

Week 2:

Lecture 2 (T 1/17)	One-way between-group ANOVA: Conceptual and statistical model

Lab 1 (W 1/18)	One-way ANOVA: Computational procedures/Using SAS to conduct a One-way ANOVA
Lecture 3 (R 1/19)	One-way ANOVA: Model comparison approach, effect size estimation, power computations

Week 3:

Lecture 4 (T 1/24)	One-way ANOVA: Assumptions and robustness issues I
Lab 2 (W 1/25)	Using SAS to estimate effect size and perform power analyses for the one-way ANOVA
Lecture 5 (R 1/26)	One-way ANOVA: Assumptions and robustness issues II

Week 4:

Lecture 6 (T 1/31)	Multiple comparisons 1
Lab 3 (W 2/1)	Using SAS to test ANOVA assumptions and perform ANOVA alternatives
Lecture 7 (R 2/2)	Multiple comparisons 2

Week 5:

Lecture 8 (T 2/7)	Multiple comparisons 3
Lab 4 (W 2/8):	Multiple comparisons Using SAS
Lecture 9 (R 2/9)	Two-way between-group ANOVA: Conceptual rationale, 2 X 2 equal-n case

Week 6:

Lecture 10 (T 2/14)	Two-way ANOVA: General equal-n case
Lab 5 (W 2/15)	Using SAS to conduct a two-way ANOVA, power computations
Lecture 11 (R2/16)	Two-way ANOVA: multiple comparisons and simple effects analyses

Week 7:

Lecture 12 (T 2/21)	Two-way ANOVA: Unequal n's
Lab 6 (W 2/22)	Using SAS to conduct non-orthogonal two-way ANOVAs, multiple comparisons and simple effects analyses
Lecture 13 (R 2/23)	Higher-order between-group designs

Week 8:

Lecture 14 (T 2/28)	One- and two-way random effects designs
Lab 7 (W 3/1)	Free lab time for midterm
Lecture 15 (R 3/2)	Mixed designs 1

Week 9:

Lecture 16 (T 3/14)	Mixed designs 2
Lab 8 (W 3/15)	Using SAS to conduct random- and mixed-effect ANOVAs
Lecture 17 (R 3/16)	Nested designs

Week 10:

Lecture 18 (T 3/21)	One-way repeated measures designs: Univariate approach I
Lab 9 (W 3/22)	One-way repeated measures designs: Univariate approach II Using SAS to conduct a one-way univariate repeated measures analysis
Lecture 19 (R 3/23)	One-way repeated measures designs: Multivariate approach

Week 11:

Lecture 20 (T 3/28)	One-way repeated measures designs: Multiple comparisons and trend analysis
Lab 10 (W 3/29)	Using SAS to conduct a one-way multivariate repeated measures ANOVA, multiple comparisons, and trend analyses
Lecture 21 (R 3/30)	Multiway repeated measures designs I: Completely within

Week 12:

Lecture 22 (T 4/4)	Multiway repeated measures designs II: Mixed between and within
Lab 11 (W 4/5)	Using SAS to conduct multiway repeated measures ANOVAs
Lecture 23 (R 4/6)	Multway repeated measures designs: Multiple comparisons and simple effects

Week 13:

Lecture 24 (T 4/11)	Power computations and effect size estimation for repeated measures designs
Lab 12 (W 4/12)	Using SAS to conduct multiple comparisons and simple effects analysis for multiway repeated measures designs/Power computations using SAS
Lecture 25 (R 4/13)	Relations between ANOVA and linear regression

Week 14:

Lecture 26 (T 4/18)	The analysis of covariance (ANCOVA) I
Lab 13 (W 4/19)	Using SAS to perform an ANCOVA
Lecture 27 (R 4/20)	The analysis of covariance (ANCOVA) II

Week 15:

Lecture 28 (T 4/25)	ANCOVA vs. blocking vs. gain scores