

# **Advanced Statistical Techniques**

## **(Coun 613) C#21514**

### **Spring 2013**

**BRIEF Version of Dec. 13, 2012. There will be changes!**

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Use the .NEXt. (or E-College) "Drop Box" and the course system e-mail for everything you submit for this course. For e-mail, all you need do is select my name from the class list when constructing your e-mail. If you have questions or comments that you don't mind sharing with the rest of the class, use the "Virtual Office" facility or the "Student Lounge" facility in e-College. If you want to send something to me from outside of e-College, then use my TAMU-C address, i.e., [Bob.Markley@tamuc.edu](mailto:Bob.Markley@tamuc.edu). This includes questions, comments, gripes, and assignments.

**IN any and all e-mail for this course PLEASE put the course number, i.e., C0613, in the subject line for your messages!**

#### **Course Description:**

The following is reputed to be the official TAMU-C Catalog description for this course:

### **COUN 613 - Advanced Statistical Techniques**

**Hours: Three**

***Includes a review of introductory statistics, presentation of basic concepts of analyses of variance, advanced correlation methods, and multiple regression, as well as other advanced statistical methods. Focuses on use of the computer for data. Prerequisites Level I and Level II research tools or equivalent or permission of the instructor.***

***Note Meets requirements for a Level III research tool course.***

**My personal interpretations, clarifications, and deletions as related to the above description:** Basically, I have chosen to focus this course on techniques for analyses of data obtained from research activities that examine the relations of

***two or more independent variables***

**with**  
**one metric dependent variable.**

Naturally, there is a need to begin by reviewing the basic processes and logic of analyses of studies that have only one independent variable and only one dependent variable.

If you have been through a psychology (or business or biology or HPER) based undergraduate statistics course, the topics dealt with here might be familiar. However, there are at least two reasons you should take this course anyway.

[1] We will cover topics in much greater depth than an undergraduate course can cover. E.g., undergraduate texts typically provide 3 measures of central tendency, we will talk about 8 measures. E.g., most undergraduate courses mandate, but don't justify, the use of  $(n - 1)$  in the calculation of a variance. Our course will provide explanations and justifications of this apparently arbitrary practice.

[2] The learning of Statistics is more like the learning of a foreign language or a motor skill. Learning only occurs with lots and lots of practice and repetition. In some other fields, e.g., Literature, reading the *play* and then one chapter in a *text*, and then hearing one *lecture* from a professor may be sufficient for you to be able to pontificate on the sexual imagery in *Hamlet*. But, believe me, three repetitions will not give you real skill and understanding of the statistical concept of *variance*. So what you will gain in this course is added depth in your knowledge (especially the whys of statistical processes) and lots of practice.

*Some General Goals:*

[34] Re-acquire (or refresh) an understanding of the basic logic and processes of statistical hypothesis testing (NHST).

[42] Learn to use a variety of NHSTs.

[08] Acquire skills involving the use of computers to analyze data and perform NHSTs.

[74] Acquire skill at recognizing the basic types of experimental designs.

[21] Acquire skill at choosing and carrying out the appropriate statistical analyses of data that are obtained from basic experimental and research designs.

[89] Learn to separate the issues that are statistical from those that are

extra-statistical when it comes to making sense of your data.

[16] Learn the details and complexities of Analysis of Variance (ANOVA).

[17] Learn some of the details and complexities of Multiple Regression (MR).

(The numerals in the [ ] immediately above are examples of "nominal scale" measurement. I would have used some sort of "bullet" marker but they don't seem to get translated well when uploaded into e-College. Also, you do need to be aware of the meaning of nominal , i.e., categorical measures.)

### **Course Activities:**

*There is a required and recommended textbook. You will read about 2/3 of the required text.*

There will be a set of 12 "Homework Assignments" which will be due at periodic intervals throughout the course. Collaboration with your colleagues is okay on these homework assignments – but make sure that your submissions at least look like they were done independently.

There will be two mid-term Quizzes and a Final Exam. Exams must be worked on independently and without collaboration with others. I will post the Assignments and the Quizzes to the Doc Sharing Folder in e-College when I get them written (or when I want you to start working on them).

There will also be occasional "Discussion Group" tasks, in which I will pose a question (or two) and you will think about, research about, and then post a response to the question(s). You will then engage in conversation and discussion with your classmates about the topic. The number of responses that you contribute to a discussion topic influences your grade for that task.

### **Time Commitments:**

There is a lot of work required for this course. It will be time consuming!!! This is a 3 credit graduate course so you should plan on **devoting between 9 and 12 (or more) clock hours** each week to this activity. The learning activities will be individual (rather than group) assignments. However, you will engage in substantive and timely discussions with classmates on all assignments via the course conferencing system. In order to successfully complete the course activities you should generally expect to connect at least three times per week. You can participate any time of the day or night since your discussions are asynchronous they will not take place in real time. You may find that the level of activities are higher shortly after the

beginning of the course and taper off toward the end of the course.

*For those who have a background in operant reinforcement theory, this course (and ALL college courses) is really set up to run on a DRH schedule. Unfortunately, most students misrepresent the situation as a FI schedule. FI schedules produce post-reinforcement pauses and "scalping" cumulative records. Scalping and PRPs in your course-related behavior can get you into trouble.*

**Textbook:**

**Required:**

**Field, A. (2009/2011). *Discovering Statistics Using SPSS, 3<sup>rd</sup> Edition*. Thousand Oaks, CA: SAGE Publications. ISBN: 978-1-84787-907-3**

**Recommended additional reading :**

**Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of behavioral research. (4th or 5th Ed.)*. Fort Worth, TX: Harcourt College Publishers. ISBN: 0-15-507897-6**

*(Actually any edition will do but the examples may be dated in the earlier versions. Amazon often has used copies of earlier editions for sale at a cheap price.) The K&L book is written by Ed Psych researchers and intended for use in Education based college settings. Thus the examples and descriptions might be more familiar to the typical student here at TAMU-C. Most Psych related stat books are written by Experimental/Social Psych researchers and thus tend to be a bit foreign to students in a College of Education.*

Reading assignments will be indicated by initial and chapter number, i.e., F-2 refers to Field's Chapter 2, and KL-32 refers to Kerlinger & Lee's Chapter 32.

Any (almost) other elementary or intermediate level psych statistics book (such as the one you used in an undergraduate course) might be a useful reference. Dr. Dave Lane (at Rice U.) used to make his introductory level, "Hyperstat," text available on-line through the Rice U. Virtual Statistics Lab. Look it up!

Additional papers and sources to be read and studied will be referenced and mentioned in various assignments, other course materials, and may appear in the Doc Sharing Folder. Note that the Doc Sharing Folder has sub-categories (Psy 681, General, & Assignments).

*Assignments and Quizzes will appear in the Doc Sharing Folder of e-College at various times.*

BTW: Previous versions of this course have utilized a text by David Howell. Before the Howell text there was a book by Norman Anderson. You may find references and mentions of both of these texts in various Lecture, Weekly Introductions, and Assignments. I have tried to sweep and correct all of the old mentions of the previous texts from these course materials but I am sure that some have been missed. You can ignore these.

However, there are two chapters from the Anderson book that I have copied (stolen) and put in the Doc Sharing folder for you to read. The first (A-0) is an introductory review of basic stats and the other (A-7) is a unique treatment of the topic of 'Interactions.'

Howell's book is academically very sound and well worth owning and utilizing as a reference. Why change? Field's book is more fun to read and has more elaborate information on how to carry out computer analyses. FYI: here is the info for the Howell text: Howell, D. C. (2010/2007). Statistical methods for Psychology. 7<sup>th</sup> Edition. Belmont, CA: Wadsworth-Cengage Learning. ISBN: 978-0-495 59784-1

### **Computers:**

Feel free to utilize a good hand calculator and/or pencil & paper to work out assignments for this class – particularly in the early assignments. However, the computational load will get heavy in later assignments and use of a computer is recommended and assumed.

Many basic statistical calculations can be done fairly easily (and economically) with a good spreadsheet program. Most of you are afflicted with EXCEL. [I prefer Corel's QuatroPro. The stat functions in QuatroPro are a bit easier to access and use. EXCEL does do better graphs. Btw: almost all computer graphing programs produce graphs that are visually misleading. The most honest graphs are still produced by use of India ink and paste on labels/lines.] . Make friends with your spreadsheet program, there are lots of neat stat functions buried in it.

Spreadsheet programs will fail you when we get to factorial and mixed model ANOVA and move beyond into basic multiple regression.

It is assumed that you will have access to the **IBM-SPSS** program which you can use to do all of the statistical calculations required for this course. **IBM-SPSS** is available in the Henderson Hall computer lab (H214) on the TAMU-C campus in Commerce. If you are off-campus, then you should acquire SPSS. There should be a "**IBM-SPSS Graduate Pack**" available through the TAMU-C Bookstore. The **Graduate Pack** can also be purchased

'on-line' from at least three different sources -- check the SPSS website for info.

It is my understanding that SPSS has been required for many versions of the "Level II" method class, which is supposed to be completed before enrolling in this "Level III" methodology class, so you might have the program already.

The somewhat simplified "**SPSS Student Version**" will **NOT** work for this course -- [1] too many advanced functions are omitted, & [2] SPSS syntax is not available.

## **Schedule**

### **Weekly Topics Schedule: Spring 2013 (tentative! ! !)**

#### **Coun 613**

##### **Week Start Date Topic/Activity**

**1 Jan. 14 Introductions & Some Basic Concepts**

**2 Jan. 22 Inferential Statistics: Process & Logic**

**3 Jan. 28 Intro to Metric I.V.s & Regression**

**4 Feb. 04 Multiple Regression**

**5 Feb 11 Review of one-way ANOVA**

**6 Feb. 18 Quiz 1 This Week. Then ANOVA issues: Multiple Comparisons & Effect Size**

**7 Feb. 25 Multiple Comparisons & Effect Size continued**

**8 Mar. 04 Begin Multiple I.V. and Factorial Designs**

**8-b Mar. 11 Spring Break**

**9 Mar. 18 Factorial Designs (extended)**

**10 Mar. 25 Repeated Measure Designs (SxA) [& Reliability]**

**11 Apr. 01 Split Plot Designs**

**12 Apr. 08 Glitches in Anova**

**13 Apr. 15 Quiz #2 and then ANCOVA & the GLM**

**14 Apr. 22 Interactions Extended**

**15 Apr. 29 Multiple Regression -- Interactions and curves**

**16 May. 06 Finals week**

### **Coda**

**I look forward working with you this semester! Along with meeting the requirements for a Level III research tool course, I think you will find this course very interesting. I hope that it changes the way you think about psychology and moves you toward independent inquiry.**

***[Okay, only strange people find stat courses interesting....but do try to enjoy the experience and change the personal meanings that you attach to the topic(s).]***