EDPSY 593A: Experimental Design/ANOVA
Winter 2016: Tue & Thu, Miller 301, 1:30-3:50p
Note: CSSCR computer lab (Savery 117) on some Thursdays, 2:50-3:50p (see next page)

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> Office Hours: Miller 312 #G by appointment (mailbox located to the left of secretary's desk)

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> Office Hours: Miller 312 back office (desk in back office area down long hallway) by appointment

Electronic Devices: To form an optimal learning atmosphere for all, **laptops/tablets/cell phones must be turned off/silent and put away** during class. *Laptops/tablets/e-readers may be used during lab and article reviews.*

Overview: This is an intensive second-level course in quantitative research methods designed for social science graduate students (especially doctoral students) who plan to rigorously consume or employ experimental design research methods. Students who take this course are from a diverse array of disciplines, including education, nursing, business, forestry, music, public health, psychology, social welfare, and speech/ hearing sciences, to name a few! The requirement for this course is that you have passed Edpsy 490 (Basic Educational Statistics) or an introductory univariate statistics course that is equivalent in content (i.e., measurement scales, frequency distributions, sampling distributions, and 2-group *z*- and *t*-tests – see me if there is any question about previous content coverage). While this course is not mathematically challenging, we assume you are proficient in basic algebra.

Course content will focus on various experimental (and quasi-experimental) research designs and how they relate to testing hypotheses using analysis of variance (ANOVA) framework. Content coverage will include fixed, random, and mixed effects models as well as multiple comparison procedures and use of control variables (covariates). Along the way we will keep in mind model assumptions, causality, validity threats, effect sizes, and power. Also, as part of our learnings, we will complete applied readings and critiques featuring applicable research designs. If time allows, we will touch on one more complex design (topic to be determined). The estimated topic and readings schedule is provided in the table below. **Note that there will be numerous handouts and other readings throughout the quarter to supplement text readings; attendance is required**.

Lomax Text	Tuesdays	Thursdays (computer lab)
Tentative EDPSY 593 Text Reading & Topic Schedule		
Review, 1.1 - 1.6	**01/05 –** Intro & Reviewing Basic Concepts	**01/07** – Basic Concepts Intro to *SPSS*
	01/12 – t-tests: Example, Assumptions, Effect Sizes, Power, & Robustness of t-tests	**01/14** – t-tests, continued *SPSS* syntax, *G*Power*, *Excel* RA
	01/19 – Understanding Validity & Causality Intro to ANOVA **(HW1 due)**	**01/21** – 1-Way Fixed, Between ANOVA: Model, Example, Computations
2.1 - 2.2	**01/26** – 1-Way Fixed, Between ANOVA: Effect Sizes, Power, MCPs	**01/28** – NO CLASS (COE EDUTALK DAY)
3.1 - 3.3	**02/02** – 1-Way Fixed, Between: MCPs cont'd Begin p-Way Fixed, Between **(HW2 due)**	**02/04** – p-Way Fixed, Between Designs
4.1 - 4.10, 5.1	**02/09 –** p-Way Fixed, Between Designs, Example	**02/11** – 1-way ANCOVA/ATI: Model, Assumption, Example
5.1 - 5.3, 6.1	**02/16** – 1-way ANCOVA/ATI: Model, Assumption, Example	**02/18** – Factorial ANOVA & ANCOVA/ATI: Wrap-up **(HW3 due)**
5.4 - 5.5	**02/23** – Random Factors/Mixed Model ANOVA Nested, Between-Subjects Designs	**02/25** – Mixed Model ANOVA: Within-Subjects Designs, Assumption, Example
6.2 - 6.3	**03/01** – Mixed Model ANOVA: Split-Plot Designs	**03/03** – Mixed Model ANOVA: Split-Plot Designs (if time: Other Designs such as RB, LS)
6.5	**03/08** – Mixed Model ANOVA: Other Designs such as RB, LS **(HW4 due)**	**03/10** – Wrap-up/Review * Potluck * **HW5 due 1:30 3/15 Miller 312**

Text: The required course text is ***Statistical Concepts, 4th Ed, by Lomax & Hahs-Vaughn (2012).*** Like most courses, there are many excellent texts on our class topics. However, our text was chosen for its content coverage breadth and relatively low cost. The book is popular and new hard copies are on backorder from the publisher; however, used or online copies may still be available at the UW bookstore. An alternative is to rent or buy the text electronically in a kindle version from Amazon.com (go to Amazon and search for the text, 2012 version): **http://www.amazon.com/Statistical-Concepts-Richard-G-Lomax-ebook/dp/B007M942CE/ref=mt_kindle?_encoding=UTF8&me=** or you may wish to buy it used from Amazon.com or some other online book retailer. Finally, if you already have an older hard copy version this text it will be OK, but not optimal (older versions will not have SPSS or G*Power examples).

Software: You will need **Word**, **Excel**, **SPSS**, and **G*Power** for completing assignments; **PLEASE OBTAIN THEM IMMEDIATELY**. Student versions of the first three are available for purchase at the UW Bookstore's Computer Department or online through UW IT, and they are also installed on computers on the fourth floor of Miller Hall, in the Odegaard library, and CSSCR (Savery Hall) **http://julius.csscr.washington.edu.** Please be sure to carefully check the version of SPSS you need, ***and see my additional notes on the next page***. **G*Power** is free software from the following website: **http://www.gpower.hhu.de/en.html**. Note: new Excel/SPSS software versions are not always compatible with older versions of themselves or each other; be sure to save "down" if you are working between multiple computers.

Computer Lab: I have scheduled computing lab time as needed at CSSCR on Thursdays, especially during the early part of the quarter. On days that we have a lab we will walk over to Savery, room 117, from our regular class (we will typically leave at 2:45 for 2:50 lab on Thurs). Labs will coincide with material taught in class **and attendance is required**.

Other Supplies: You will need a **memory stick/jump drive** to save files during labs, and **calculator** that can compute a number raised to a power ($\wedge$ or y^x), square roots ($\sqrt{}$), natural logarithms (**ln**), and exponentiation (e^x or **exp**) of a number. The **TI-30Xa SE** and **HP 30S** are both examples of calculators that can perform these functions. A hefty **3-ring binder** to keep your notes and handouts in is also strongly recommended, as well as colored pencils/pens/highlighters.

Class Email List: The class website is: **https://canvas.uw.edu/courses/1022023**. I will create a class email list to communicate course announcements and homework sets that will also be posted on the course website; be sure that you can receive group emails in your email settings. Note that class emails do not allow anyone to select "reply all" (all queries go to me directly). I will also be setting up small working groups within the first week of class for you to collaborate on in-class exercises, article reviews, and homeworks.

Performance Evaluation (Grades): Grades comprise participation and homework performance. If you actively participate in class and put forth timely effort on your homeworks, your grade will be fine. I am interested in your mastery of concepts and ability to apply learnings in context.

1. Attendance/Participation (20%)
Attendance, in concert with readings and assignments, is an important feature of the learning process and is thus given weight in your course grade. In addition to simply attending class and lab, there will be times in the quarter that I will ask you to do additional statistical readings as well as applied readings for in-class discussion.
- **Absence Make-ups**: If you know you need to miss class, let me know via email and I will provide a make-up attendance assignment for you after you return. Note that *all make-ups must be submitted <u>hard copy</u> to me by the last day of class for credit consideration, and there is no make-up for the last day of class.*

2. Homeworks (80%)
There will be 5 homeworks this quarter that will be emailed to the class in a manner corresponding to topic coverage (the last homework is cumulative). You will typically have approximately 1-2 weeks to complete each assignment; the turn-around time and number of points possible will depend on the amount of work required. Homework 2 is usually the most time-consuming. You may work in groups for discussing how to tackle problems in the assignments; however, each person is expected to turn in their own **original** work (**hard copy**).
- **Homeworks should be typed in APA format** for all non-calculation questions (in complete sentences), and all necessary SPSS syntax and outputs should be embedded in your write-ups.
- **Homeworks can be time consuming** and you may need help with a software glitch or getting feedback: please plan to work on your homework as soon as you get it.
- **Late work**: I accept late homework with a 5% deduction of total possible points for *each calendar day* it is late. To receive any credit consideration, late homeworks must be turned in by the last day of class.
An accumulation of 98% of the total points will receive a decimal grade of 4.0, and an accumulation of 68% of the points will receive a graduate passing grade of 2.7 (note however that 3.0 is the grade generally required of graduate TAs/RAs). The decimal grades between 4.0 and 2.7 are in intervals of 2-3% of the points.

Students with Disabilities: If you require accommodations for a disability, you will need to contact Disability Resources for Students at 206-543-8924 or **uwdrs@uw.edu** (website: **http://depts.washington.edu/uwdrs**) to propose an educational plan and obtain a letter detailing the plan. Bring the letter to me in person or via email, and we will privately discuss arrangements for accommodations.

Supplementary Resources (<u>Not</u> Required)

Experimental Design

Kirk. R. E. (2012). *Experimental Design (Fourth Edition)*. Sage Publications, Inc.

Maxwell, S. E., & Delaney, H. D. (2003). *Designing Experiments and Analyzing Data: A Model Comparison Perspective (Second Edition)*. Psychology Press.

Meyer, J. L., Wells, A. D., & Lorch, Jr., R. F. (2010). *Research Design and Statistical Analysis (Third Edition)*. Routledge.

Pagano, R. R. (2012). *Understanding Statistics in the Behavioral Sciences* (Tenth Edition). Cengage Learning.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2001). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. Cengage Learning.

APA Formatting

American Psychological Association. (2009). *Publication Manual of the American Psychological Association (Sixth Edition)*.

Cooper, H. (2010). *Reporting Research in Psychology: How to Meet Journal Article Reporting Standards*. APA.

American Psychological Association's website (for purchasing APA books): **http://www.apa.org/pubs/books/**

Purdue University's Online Writing Lab (OWL) for APA Style: **https://owl.english.purdue.edu/owl/resource/560/01/**

SPSS software (for newbies)

Field, A. (2013). *Discovering Statistics using IBM SPSS Statistics*. Sage Publications.

Notes on SPSS Software Versions for UW Students, <u>Especially Mac Users</u>

SPSS has been around for a long time. For a short period it was known as "PASW" but it is now back to its original name. I am sharing information from the UW's IT department regarding issues related to SPSS installation/use, especially for **Mac** users. SPSS was never created with Mac operating systems in mind, and it has had a hard time keeping up with all the different Mac platforms. If possible, I recommend you get the *disk/media* version of SPSS in case you have to re-install it for some reason. It costs a few dollars more, but it may save you some tears of frustration. If none of these work for you, use the versions that are physically available on campus (like CSSCR, fourth floor of Miller, or the libraries).

VERSIONS AVAILABLE FROM UW BOOKSTORE & UW IT (NOT ALL VERSIONS AVAILABLE!!!)

- **SPSS 19** <u>perpetual</u> license is no longer available as of July 2015
- **SPSS 22 or 23** <u>annual</u> license (must be renewed every year on July 1) = $100 downloadable: http://www.washington.edu/itconnect/wares/uware/spss-21-annual-subscription, or $115 with-media at UW bookstore: http://www.bookstore.washington.edu/_Common/Images/pdf/tech_center_current/acad_software_2015_11_03.pdf

PC USERS: Versions available through IBM

- **SPSS 18** is supported on Windows 7 or lower (unknown if it supported on Windows 8) (*no longer available* through UW)
- **SPSS 19 through 22** is supported on Windows 7 and Windows 8
- **IBM's GRADPACK23** **Statistics** **Standard** **6-month rental version**: $60 (12-month $100) downloadable only: http://estore.onthehub.com/WebStore/ProductsByMajorVersionList.aspx?vsro=8&pc=ddc848d8-b4fe-e111-bd05-f04da23e67f6

MAC USERS: Versions available through IBM (IMPORTANT TO READ BEFORE ANY PURCHASE)

- **SPSS 18 & 19** (*no longer available from UW*) releases supported on Apple Mac OS 10.5 (Leopard) and 10.6 (Snow Leopard) with Intel processor. NOT supported on Mac OS 10.7 (Lion) and later.
- **SPSS 20** (*not available from the UW*) supported on Apple Mac OS X 10.6 (Snow Leopard) & 10.7 (Lion) with Intel processor. SPSS 20 was developed and released prior to Apple's release of 10.8 (Mountain Lion) operating system. It is not supported on 10.8, meaning any issues found can only be addressed in future releases. However, no serious issues are anticipated, and SPSS 20 can run on Mountain Lion with Intel processor but: (1) for new installations of 20 it is strongly recommended to read Technote 1606447 first and follow the instructions about Apple's new Gatekeeper security feature, and (2) if you are upgrading the operating system around an existing installation of 20.0, you may experience issue with your license code. See Technote 1607184 for info.
- **SPSS 21** supported on Apple Mac OS X 10.6 (Snow Leopard), 10.7 (Lion), & 10.8 (Mountain Lion) with Intel processor.
- **SPSS 22** supported on Apple Mac OS X 10.7 (Lion) & 10.8 (Mountain Lion) with Intel processor. **SPSS 22 NOT supported for Apple Mac OS X 10.6** (Snow Leopard). SPSS 22 was developed and released prior to Apple's release of OS X 10.9 (Mavericks). Per SPSS Product Management, version 22 can be installed on Mac OSX 10.9 **if you install Apple Java SE 6 (1.6.0_65) on OS X 10.9 first** installing 22. See http://support.apple.com/kb/dl1572 for download.
- **SPSS 23** supported on Apple Macintosh OS X 10.9 (Mavericks) and 10.10 (Yosemite) with Intel processor.
- **IBM's GRADPACK23** **Statistics** **Standard** **6-month rental version** supported on Apple Mac OS X 10.8, 10.9, 10.10: $60 (12-month $100) downloadable only: https://estore.onthehub.com/WebStore/OfferingsOfMajorVersionList.aspx?pmv=89cf975c-47c3-e411-940a-b8ca3a5db7a1&cmi_mnuMain=ed6ad73c-7bc7-e011-ae14-f04da23e67f6
- **For more information**, see the IBM's website: https://www-304.ibm.com/support/docview.wss?uid=swg21507587

SOFTWARE RESOURCES WHEN THINGS AREN'T WORKING

- IBM product support/documentation if you got a disk version (see the product packaging for IBM's online support documentation)
- UW IT department if you did a download version of the software (help@uw.edu)
- CSSCR staff (computer lab) (consulting hours posted on: http://julius.csscr.washington.edu/)