Spring 2019

Educ/Psy 6600: Research Design & Analysis 1

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Office Location: EDUC 455
Office Hours: by appointment

Lecture Location: HPER 116 (may change)
Lecture Hours: **T & R 4:30 – 5:45 pm**

Course Purpose

Research Design & Analysis I is designed to provide the student with a **practical, applied approach** to the application of fundamental behavioral and educational research design and statistical principles. Students will learn how to differentiate and appropriately select the best statistical methods for use in various research designs and analytical problems.

This course will mostly focus on **basic statistical techniques** and **several forms of the ANOVA model**, which can be used by themselves or serve as building blocks for more advanced techniques in other courses. Students will also learn how to:

1) Use the R statistical programming environment (via the R Studio IDE) to analyze data and
2) Interpret and communicate the results of analyses (including creating reproducible research reports with R Markdown)

Prerequisites

- ☐ Completion of EDUC/PSY 6570 'Introduction to Educational & Psychological Research'
- ☐ Passing the EDUC/PSY 6600 pretest (70% or better)

Course Structure

This is a lecture and applied skills course. Students will be expected to demonstrate their learning via *classroom participation, assignments,* and *examinations.* The purpose of class lectures is to elaborate on interesting or difficult material presented in the text, conduct skill-building exercises and demonstrations, and to provide a forum for discussion.

Required Materials

- Cohen, B. H. (2008). **Explaining Psychological Statistics** (4th Ed.). New York: Wiley.
- ***eBook*** *Encyclopedia of Quant Methods in R (free online at https://cehs-research.github.io/eBooks/)*
- **Canvas** (my.usu.edu) Please check Canvas frequently for course updates, assignments, & grades
- **R**, **R Studio**, & **TeX** software (all free to download online, instructions will be given)
- **G*Power** software (free for PC or Mac at www.gpower.hhu.de)
- Scientific or statistical **calculator** (may be a graphic calculator, but NOT a cell phone, iPod, ect.)

Note: it is advantageous to bring a laptop to class, but not required.

Preparation & Attendance

The nature of this course ***requires*** regular class attendance and participation. The student is therefore expected to read assigned chapters **BEFORE** each class session in order to be prepared for classroom activities and discussion (see 'Summaries' below). Please note that this is a 3-credit course in a 15-week period, requiring an average of approximately **9 HOURS of time outside of class EVERY WEEK** devoted to reading and homework for students who are adequately prepared for this course. Students should **not miss class lectures** as some material covered in class will not be covered in the text. All information covered in the text and lectures is fair game for examination questions. The instructor encourages all students who have or anticipate attendance difficulties to discuss these issues with her as soon as possible

Grade Components

I. Chapter Summaries — 30% of grade

By design, lectures are designed to enhance your understanding and experience with statistical concepts, rather than present them the FIRST time (**this is not an introductory course**). It is of upmost importance that students read the material **PRIOR** to the designated lecture, as well as read through the associated homework assignment. This ensures class time may be more valuably spent on answering higher level questions and preparing students for assignments, but more importantly for their conducting their own research. To facilitate this, a chapter **summary or outline** of the assigned readings is due on the day the material is covered in class, **before** the lecture time begins.

A skeleton will be provided for typing your notes into an **R Notebook using R markdown**. Alternatively, students may choose to type notes in a standard word processer, like Microsoft Word. **Tables, formulas, pictures, and examples may be included** as each student finds appropriate. Each of the SEVENTEEN chapter's summaries (no summary required for chapter 1) will be turned in electronically by **4:00 pm** on the due date (see course schedule) via **CANVAS (knitted .pdf or word format only,** no .Rmd or other formats accepted). Summaries will be reviewed and assigned full credit/no-credit.

Each student must compose his or her own work. Summaries must NOT be a copy of the lecture slides or notes. Summaries maybe added to and printed out for use during examinations. Please note, copied summaries (either from posted lecture notes or from students of previous semesters), summaries that violate page specifications, or late summaries will not receive any credit.

II. Unit Homework Assignments — 35% of grade

SEVEN equally weighted unit assignments form the basis for learning the practice of statistics at the level required by this course. The units are outlined on the course schedule (chapters are from Cohen's 4th edition text). Details regarding what is required for each assignment will be available on Canvas. Assignments require the manipulation or analysis of data and communication of results (complete sentences, ect.). Most, if not all, assignments will require analysis in R. Additional reading of provided articles will be required for most units.

All assignments are REQUIRED: NO scores will be dropped. Students may work together, however each student must turn in his or her own work, **not photocopies or identical replicates**. Assignments are due by **7:00pm** on the due date (see course schedule). Details on what is required to be turned in will be posted on canvas and detailed within the packets.

Rubrics will be used for grading. Half of the points are earned for **completion** and half for **correctness** (based on a subset of problems chosen for grading). Skipped portions of an assignment may result in loss of points for **BOTH** completeness **AND** correctness. Late assignments turned in within 24 hours of the due date will receive **half** the score earned. No points will be awarded thereafter.

III. Examinations — 35% of grade

SIX equally weighted examinations will be given during this course (same unit/chapter breakdown as the assignments; unit 0 does not have an exam). Examinations will be given IN CLASS and will require less than 30 minutes. Examinations will cover all material discussed in class AND in the readings (which are not necessarily one and the same). No code or syntax will be required on exams, however partial output may be included, and students will be expected to interpret the results and communicate the meaning correctly.

All formulas needed will be provided on examinations (unless noted during examination reviews). Applicable statistical tables will also be provided (Appendix A of Cohen's textbook). Calculators may be used, but not any electronic device that may transmit/receive, such as cell phones, ipods, tables, ect.

All exams are REQUIRED: NO scores will be dropped. Examinations may consist of definitions, multiple choice questions, computations, output interpretations, and short-answer essays. Student may use their own printed chapter summaries, homework, and other notes during examinations. Only 30 minutes will be given, so be prepared.

Please make every effort not to miss examinations as they cannot be rescheduled unless there is documented evidence for the reason of absence (e.g., serious illness, accident, court). In the event of an emergency the student must contact the instructor immediately and BEFORE the examination.

* No exam is not truly comprehensive; HOWEVER, all prior material is fair game on every exam. *

The standard grade breakdown used by Utah State University will be followed to assign the student a letter grade. The final percentage will be determined by a weighted average of the student's percentages earned in each of the three areas.

	B+ 87-89%	C+ 77-79%	
A 93-100%	B 83-86%	C 73-76%	D 60-69%
A- 90-92%	B- 80-82%	C- 70-72%	F < 60%

Free Advice

Many of you will learn to appreciate, and may even develop a deep interest in, statistical analysis over the course of our semester together. I hope that you do as the skills you will acquire in this course will benefit you in many ways. You will see that statistical methods are tools in the social scientist's toolkit, which will help you to better interpret and understand the applied research of your given field and will be of great value to you in conducting your own research.

However, I understand that many of you are somewhat "math-phobic". Although statistics is a branch of mathematics, in this applied course we keep the level of mathematics to a minimum – arithmetic and high school algebra. So, please do not let a fear of mathematics prevent you from excelling in this course. Some of you may also fear work on the computer. The practice of modern statistics relies almost exclusively on computer software. I believe that learning a statistical computing language or syntax is key to the learning of statistics. However, you should expect some frustration as you begin to use the statistical software in this course, but as you gain experience you will come to appreciate the power of statistical software as a tool for discovery. So, be patient with yourself and the material, it comes naturally to very few.

A final word of warning: Beware technology misbehaving near deadlines. All summaries and assignments are to be turned in before the strict deadlines. Additionally, most assignments require some use software to complete them. It never ceases to amaze me how computers seem to sense when you are in a time crunch since they seem to not play nice every time I procrastinate.

Changes in Assignments and Schedule

The instructor reserves the right to make changes to this syllabus at any time. Changes will be announced in class and posted on Canvas. The included schedule and all deadlines are extremely tentative and will be adjusted as needed.

Students Needing Assistance with the English Language

Several assignments in this course require English composition. If you feel you need assistance, please visit the USU Writing Center. They have tutors available to help: http://writingcenter.usu.edu.

Academic Integrity - "The Honor System"

Each student has the right and duty to pursue his or her academic experience free of dishonesty. The Honor System is designed to establish the higher level of conduct expected and required of all Utah State University students.
The Honor Pledge: To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lives by the Honor Pledge:

- Espouses academic integrity as an underlying and essential principle of the Utah State University community;
- Understands that each act of academic dishonesty devalues every degree that is awarded by this institution;
- Is a welcomed and valued member of Utah State University.

Plagiarism

Plagiarism includes knowingly "representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged used of materials prepared by another person or agency engaged in the selling of term papers or other academic materials." The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

Sexual Harassment

Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any "unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature." If you feel you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266

Students with Disabilities

Qualified students with disabilities may be eligible for reasonable accommodations. If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center (797-2444 voice, 797-0740 TTY, or toll free at 1-800-259-2966; Room 101 of the University Inn), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative format, large print, audio, diskette, or Braille."

Withdrawal Policy and "I" Grade Policy

Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. In such cases an ‘I’ will be submitted as the grade for the semester. The term 'extenuating' circumstances includes:

(1) incapacitating illness which prevents a student from attending classes for a minimum period of two weeks,
(2) a death in the immediate family,
(3) financial responsibilities requiring a student to alter a work schedule to secure employment,
(4) change in work schedule as required by an employer, or
(5) other emergencies deemed appropriate by the instructor.

Course Schedule

Date	Day	Summary Due by 4:00pm	Lecture Topic	Unit	Assignment Due by 7:00pm
8-Jan	Tues	Intro	Syllabus, Textbook, Ihno's Dataset, Install Software	0	Preparatory Topics
10-Jan	Thur	Ch 1	Variables, Scales, Rounding, & Summation		
15-Jan	Tues	R	R/R Studio Orientation, Data Import & Manipulation		
17-Jan	Thur	APA	APA Style & Journal Articles		
22-Jan	Tues	Ch 2	Exploration of Data with Plots	1	HW 0
24-Jan	Thur	Ch 3	Summarizing Data with Descriptive Statistics		Exploratory Analysis
29-Jan	Tues	Ch 4	Standardized Scores & The Normal Distribution		
31-Jan	**Thur**		**EXAM 1**		**HW 1**
5-Feb	Tues	Ch 5	Intro to Hypothesis Testing: 1 Sample z-test	2	Groundwork for Inference
7-Feb	Thur	Ch 6	Confidence Interval Estimation: The t Distribution		
12-Feb	Tues	Ch 7	Independent Samples t-Test for Means		
14-Feb	Thur	Ch 8	Statistical Power & Effect Size		
19-Feb	**Tues**	♥	**EXAM 2**		**HW 2**
21-Feb	Thur	Ch 9	Linear Correlation		
26-Feb	Tues	Ch 10	Linear Regression		
28-Feb	Thur	Ch 11	Matched t-Test		
5-Mar	**Tues**		**EXAM 3**		**HW 3**
7-Mar	Thur	Ch 12	1-way Independent Groups ANOVA	4	ANOVA with Repeated Measures
			Spring Break - no class		
19-Mar	Tues	Ch 13	Multiple Comparisons		
21-Mar	Thur				
26-Mar	Tues	Ch 14	2-way ANOVA & Interactions		
28-Mar	Thur				
2-Apr	**Tues**		**EXAM 4**		**HW 4**
4-Apr	Thur	Ch 15	Repeated Measures ANOVA	5	ANOVA with Repeated Measures
9-Apr	Tues				
11-Apr	Thur	Ch 16	2-way Mixed Design ANOVA		
16-Apr	Tues				
18-Apr	**Thur**		**EXAM 5**		**HW 5**
23-Apr	Tues	Ch 19/20	The Binomial Distribution & Chi-Squared Tests	6	Categorical Data
30-Apr	**Tues**		**4:30-6:20 pm ← EXAM 6**		**HW 6**