

# EDUC/PSY 6600: Research Design & Analysis I

Spring 2019 – Instructor: Dr. Sarfaraz Serang

Monday and Wednesday 2:30 p.m. – 3:45 p.m. in SCCE 310

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## **Prerequisites:**

- 1) Completion of EDUC/PSY 6570 ‘Introduction to Educational & Psychological Research’
- 2) Passing the EDUC/PSY 6600 pretest (70% or better)

## **Course Overview:**

*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.

The course will be divided into 3 sections, each capped by an exam. The first unit will cover descriptive statistics and the basics of hypothesis testing. The second unit deals with power, regression, and one-way ANOVA. The final unit focuses on extensions of the ANOVA model and categorical data analysis. Each unit will also contain 3 homework assignments, consisting of a mix of textbook and R problems.

The structure of the course will combine lecture and lab components. The lecture portion will involve descriptions of the statistical topics while the lab portion will introduce statistical software and demonstrate how the models discussed in the lecture can be fit using the software. The lecture and lab will be interwoven to enhance understanding of the topics.

## **Course Learning Objectives:**

There are three primary learning objectives for this course. The first is understanding the motivation, logic, and conceptual underpinnings of statistical analysis. The second is the ability to conduct the statistical tests discussed and interpret and report the results. The final objective is to be able to use the R statistical computing language.

**Materials:**

Course materials will be posted on Canvas (<https://canvas.usu.edu>). This includes lecture slides, assignments, etc. Announcements will also be made via Canvas.

The textbook for this course will be Cohen's *Explaining Psychological Statistics* (see reference below). An electronic copy is freely available through the USU library. Students are expected to read the corresponding chapters accordingly, as they will be responsible for material from them not covered in the lectures.

- Cohen, B. H. (2013). *Explaining Psychological Statistics* (4th Ed.). New York: Wiley.

A calculator will be required to perform calculations on the exams. A basic calculator will work just fine, but a scientific or graphing calculator can also be used.

Students are encouraged to bring their own laptops. The primary statistical software for this course will be R (<https://www.r-project.org>). R is a free open-source statistical software package that can be used for a wide (and ever expanding) range of purposes. We will also be using RStudio (<https://www.rstudio.com>), a free graphical user interface for R.

**Coursework:***Homework Assignments (30%):*

There will be 9 homework assignments throughout the course, three per unit. Homework assignments will consist of a mix of textbook and R problems, and will be due at least one week after the last relevant lecture. Both portions of the homework will be due by the beginning of class on their assigned due date. Book problems will be submitted in class, and R problems should be submitted to Canvas.

Responses to book problems should include all work needed to obtain the solution (when appropriate). Responses to R problems should include the code to generate the output as well as the output itself (results, plots, etc.). These should be submitted to Canvas in a Word document (.doc, .docx) or PDF. All R code used should also be submitted to Canvas in a separate .R file.

Students may work together on assignments, but each student must turn in individual work (i.e. no identical assignments). Late work will result in a 10% deduction for each day the assignment is late.

*Examinations (60%):*

Three equally weighted examinations (20% each) will be given during this course. Exams are not intended to be comprehensive, but material does build upon itself, so all prior material is fair game. Exams will be given in class and students will have the usual full class period to complete them (1 hour 15 minutes). Exams 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 any electronic device that transmit and receive signals such as cell phones, laptops, tablets, etc. are not permitted for use on exams.

All exams are required; no scores will be dropped. Examinations may consist of definitions, multiple choice questions, computations, output interpretations, and short-answer essays. Exams are open-notes, but closed-book. Students may use their own hand-written materials, including notes, homework, etc. but not typed or printed materials.

*Attendance and Participation (10%):*

Students are expected to attend class. Grasping the material from the slides without the accompanying lecture will be challenging. Class participation in the form of asking and answering questions, being involved in discussions, etc. is required and will make up 10% of the final grade.

*Grade Breakdown:*

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 dividing the student's total points earned by the total number of possible points:

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

**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.

**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.

**Disability:**

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please notify the instructor and contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn # 101, (435) 797-2444, [drc@usu.edu](mailto:drc@usu.edu)). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with the instructor to provide accommodations.

**Tentative course schedule (subject to change):**

Week	Date	Topic	HW Due
1	M 1/7	Introduction to Course, Syllabus	
	W 1/9	Introduction to R	
2	M 1/14	Ch 1 – Variables, Scales, Rounding, Summation	
	W 1/16	Ch 2 – Exploration of Data with Plots	
3	M 1/21	No class – MLK day	
	W 1/23	Ch 3 – Summarizing Data with Descriptive Statistics	HW 1 (Ch 1-2)
4	M 1/28	Ch 4 – Standardized Scores, Normal Distribution	
	W 1/30	Ch 5 – Intro to Hypothesis Testing, 1-Sample z-test	
5	M 2/4	Ch 6 – Confidence Interval Estimation, t Distribution	HW 2 (Ch 3-4)
	W 2/6	Ch 7 – Independent Samples t-test for Means	
6	M 2/11	Ch 8 – Statistical Power & Effect Size	HW 3 (Ch 5-6)
	W 2/13	Exam 1 – Ch 1-7	
7	M 2/18	No class – President’s Day	
	W 2/20	Ch 9 – Linear Correlation	HW 4 (Ch 7-8)
8	M 2/25	Ch 10 – Linear Regression	
	W 2/27	Ch 11 – Matched t-test	
9	M 3/4	Ch 12 – One-way Independent Groups ANOVA	
	W 3/6	Ch 13 – Multiple Comparisons	HW 5 (Ch 9-11)
10	M 3/11, W 3/13	No class – Spring Break	
11	M 3/18	Ch 13 – Multiple Comparisons	
	W 3/20	Ch 14 – Two-way ANOVA	
12	M 3/25	Ch 14 – Two-way ANOVA	HW 6 (Ch 12-13)
	W 3/27	Exam 2 – Ch 8-13	
13	M 4/1	Ch 15 – Repeated Measures ANOVA	HW 7 (Ch 14)
	W 4/3	Ch 15 – Repeated Measures ANOVA	
14	M 4/8	Ch 16 – Two-way Mixed Design ANOVA	HW 8 (Ch 15)
	W 4/10	Ch 16 – Two-way Mixed Design ANOVA	
15	M 4/15	Ch 19 – Binomial Distribution	HW 9 (Ch 16)
	W 4/17	Ch 20 – Chi-Squared Tests	
16	M 4/22	Statistical analysis in SPSS	
17	M 4/29	Exam 3 – Ch 14-16, 19-20	