# Research Design & Analysis I

**EDUC/PSY 6600**

## Syllabus

**Fall Semester 2016**


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Time: Tuesday and Thursday, 4:30 - 5:45
Location: EDUC 130A
Credits: 3

**Description**
This course is an introduction to statistical hypothesis testing and covers topics, such as z test and *t* test, analysis of variance (ANOVA), and linear regression analysis. Participants will gain statistical and methodological knowledge about important and often used statistical methods and how to interpret statistical results. The course provides a foundation for more advanced statistical techniques, such as Multiple Regression Analysis, Multilevel Modeling (MLM), and Structural Equation Modeling (SEM).

**Objectives**
This course has three objectives:

- Understanding basic statistical concepts and techniques (e.g., statistical hypothesis testing, effects sizes)
- Conduct basic statistical analysis using a software package, such as SPSS or R, and syntax.
- Learning to interpret statistical results and computer outputs

After the course, participants will be able to test differences between two and more groups, assess statistical group interactions, analyze associations between two variables, conduct power analysis, and calculate and evaluate effect sizes. Participants will also learn to use SPSS syntax. The course also aims to prepare participants for learning more advanced techniques, such as Structural Equation Modeling and Multilevel Modeling.

Students interested in a less technical and more of an applied statistic course should consider the course EDUC 6050.

**Required Readings**
Healey, J. (2012). *Statistics: A tool for social research* (9th Ed.). Belmont, CA: Wadsworth. (Will be provided on Canvas.)

Zimmerman, D. W. (1997). A note on interpretation of the paired-samples *t* test. *Journal of Educational and Behavioral Statistics, 22*, 349-360.

OR

Cohen, B. H. (2013). *Explaining Psychological Statistics* (4th Ed.). Hoboken, NJ: Wiley.

**Recommended Readings**

Diez, D. M., Barr, C. D., & Cetinkaya-Rundel, M. (2014). *OpenIntro statistics* (2nd ed.): CreateSpace. (Will be provided on Canvas.)

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis for the social, behavioral, and biomedical sciences. *Behavior Research Methods 39*, 175-191.

Pagano, R. (2012). *Understanding Statistics in the Behavioral Sciences*: Nelson Education.

Wilcox, R. (2011). *Modern statistics for the social and behavioral sciences: A practical introduction*. Boca Raton, FL: CRC Press. (Uses R to illustrate the analysis.)

**Statistical Software**

- IBM SPSS (Statistical Package for the Social Science)
  IBM SPSS is available to students through Citrix: https://usu.service-now.com/services/kb_view.do?sysparm_article=KB0013281
- R: The R Project for Statistical Computing (free software available at https://www.r-project.org/)
- G*Power for Power analysis (free software available at http://www.gpower.hhu.de/en.html)

**Annotated SPSS Output**

Annotated SPSS output for many statistical procedures is available at http://www.ats.ucla.edu/stat/AnnotatedOutput/ (see also http://www.ats.ucla.edu/stat/spss/).

**Online Materials**

Slides and computer files will be provided on Canvas.

**Prerequisites and Pretest**

There are two prerequisites for EDUC/PSY 6600: 1) Completion (with a passing grade) of EDUC/PSY 6570 'Introduction to Educational & Psychological Research' (or an approved equivalent) and 2) passing the EDUC/PSY 6600 pretest (70% or better).

These two prerequisites are mandated by the College of Education & Human Services to ensure that each student has the necessary background knowledge to be successful in this course.

Another prerequisite is that students have some knowledge about descriptive statistics, including different types of measures of central tendency and dispersion.

**Class Preparation**

This is a 3-credit course requiring an average of approximately 9 hours of time outside of class per week devoted to reading and homework for students who are adequately prepared for this course. Participants are expected to read assigned readings before each class session.

**Class Participation**
This course requires regular class attendance and participation in all class activities, which are intended to support the learning objectives. I encourage all students who have or anticipate attendance difficulties to discuss these issues with me.

**Assignments: Research Papers (30 points total)**
Three independent research paper assignments are required during this course.

Research paper # 1 should either use one of the following methods:

- One-sample *t* test with effect size calculation
- Independent-sample *t* test with effect size calculation

Research paper # 2 should either use one of the following methods:

- Linear regression analysis
- Partial correlation

Research paper # 3 should either use one of the following methods:

- ANOVA with two or more group variables
- ANCOVA
- Dependent-sample *t* test with effect size calculation

Each research paper should have

- a cover page with a title of the project, the name of the student, and the name(s) of the other student(s) of the group
- a brief introduction with the purpose of the study or hypotheses or research questions at the end
- a brief method section (including a brief sample description)
- a result section
- a brief discussion or conclusion.

The structure of each paper should be similar to that of a short scientific article, and some relevant and newer references should be included. Figures and tables should be in line with APA standards. Text can be single-spaced and main tables and figures can be embedded in the text.

The analyses for each paper may be done in groups of 2 or 3 and the research questions or hypotheses can be the same for all members of a group. Each student needs to hand in his or her own research papers. Each paper (introduction, result section, and discussion or conclusion) should be substantially different from the other members' papers (e.g., no cutting and pasting from each other's work, no paraphrasing, etc.). The paper assignments are to be uploaded to Canvas.

Participants are welcome to use their own data, publicly available (archival) data, or the data collected in the course.

Part of the research papers will be presented in class by the whole group (see details below). The research papers are due after the presentations (see course schedule for details).

Participants are welcome to use their own data, publicly available (archival) data, or the data collected in the course.

**Group Presentations**
Three group presentations are required during this course. Each presentation will be about 5 minutes. The three presentations are

Presentation # 1: One-sample *t* test or independent-sample *t* test.

Presentation # 2: Linear Regression Analysis or Partial Correlation.

Presentation # 3: ANOVA, ANCOVA or dependent-sample *t* test.

These three presentations will not be graded.

**Examinations (40 points total)**
There will be 3 examinations during this course. Each examination will be worth 20 points. The better two of the three examinations will be scored (40 points maximum). The examinations will include multiple choice questions and short answer essays, and creation and completion of Figures. There may be some basic calculations required.

Examination # 1 will cover all of the material since the first week of the semester.

Examination # 2 will cover all of the material since Exam # 1.

Examination # 3 will cover all of the material since Exam # 2

These examinations will be open note but not open internet. Notes are defined as materials that each student has created or gathered himself or herself during the course (copy-paste of materials covered in books, papers, courses, and provided on webpages is allowed). The use of a calculator is also allowed.

**Grading and Evaluation**
The standard grade break down 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 | 100% to 93% | C | < 77% to 73% |
| A- | < 93% to 90% | C- | < 73% to 70% |
| B+ | < 90% to 87% | D+ | < 70% to 67% |
| B | < 87% to 83% | D | < 67% to 63% |
| B- | < 83% to 80% | D- | < 63% to 60% |
| C+ | < 80% to 77% | F | < 60% to 0% |

There are 80 points possible in this course.

| | Points |
|---|---|
| Research Paper # 1 | 10 |
| Research Paper # 2 | 10 |
| Research Paper # 3 | 10 |
| 2 Exams (each 20 points) | 40 |
| Total | 70 |

**Tentative Course Schedule**

| Week | Date | Day | Topic (Reading) | Assignment |
|---|---|---|---|---|
| **Descriptive Statistics** | | | | |
| 1 | 08/30 | Tue. | Introduction<br>Measures of Central Tendency (Chap. 3) | Create groups |
| | 09/01 | Thurs. | Measures of Dispersion (Chap. 4)<br>The Normal Distribution (Chap. 5) | Brainstorm topics |
| 2 | 09/06 | Tue. | SPSS Exercise with Andrew Craig | Chose one topic |
| **Inferential Statistics** | | | | |
| | 09/08 | Thurs. | The Normal Distribution (Chap. 5) | Descriptive statistics, graphical analysis, and *t* test for Assignment 1 |
| **Hypothesis Testing Part I: Comparison of two groups** | | | | |
| 3 | 09/13 | Tue. | Estimation Procedure (Chap. 7)<br>Hypothesis Testing I: The One-Sample Case (Chap. 8) | |
| | 09/15 | Thurs. | Hypothesis Testing II: The Two-Sample Case (Chap. 9) | |
| 4 | 09/20 | Tue. | Statistical Power and Effect Size<br>Power Analysis using G*Power (Faul et al., 2007) | |
| | 09/22 | Thurs. | SPSS Exercise with Andrew Craig | |
| 5 | 09/27 | Tue | Group presentation I | |
| | 09/29 | Thurs. | Time for questions | |
| 6 | 10/04 | Tue. | Exam 1 | |
| **Hypothesis Testing Part II: Assessing of Associations** | | | | |
| | 10/06 | Thurs. | Linear Correlation (Chap. 12) | |
| 7 | 10/11 | Tue. | Partial Correlation (Chap. 16) | Assignment 1 due |
| | 10/13 | Thurs. | Linear Regression (Chap. 16) | Correlation and regression analysis for Assignment 2 |
| 8 | 10/18 | Tue. | Multiple Regression (Chap. 16) | |
| | 10/20 | Thurs. | Friday Schedule – NO CLASS | |
| 9 | 10/25 | Tue. | SPSS Exercise with Andrew Craig | |
| | 10/27 | Thurs. | Group presentation II | |
| 10 | 11/01 | Tue. | Time for questions | |
| | 11/03 | Thurs. | Exam 2 | |
| **Hypothesis Testing Part III: Comparison of multiple groups and time points** | | | | |
| 11 | 11/08 | Tue. | One-Way Independent ANOVA (Chap. 10) | |
| | 11/10 | Thurs. | Multiple Comparisons (Chap. 10) | Assignment 2 due |
| 12 | 11/15 | Tue. | Two-Way ANOVA (Kenny, 1987) | ANOVA, ANCOVA, or dependent-sample *t* test for Assignment 3 |
| | 11/17 | Thurs. | ANCOVA (Fields, 2012; Boomsma, 2012) | |
| 13 | 11/22 | Tue. | Dependent-Sample *t* Test (Zimmerman, 1997) | |
| | 11/24 | Thurs. | Thanks Giving – NO CLASS | |
| 14 | 11/29 | Tue. | SPSS Exercise with Andrew Craig | |
| | 12/01 | Thurs. | Repeated Measures ANOVA | |
| 15 | 12/06 | Tue. | Group presentation III | |
| | 12/08 | Thurs. | Time for questions | Assignment 3 due |
| 16 | | | Exam 3 | |

*Note*. The chapters refer to Healey, J. (2012). *Statistics: A tool for social research* (9th Ed.). Belmont, CA: Wadsworth. SPSS exercises are in Family Life, Room # 201.

# Utah State University Selected Policies and Procedures

**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**
The Americans with Disabilities Act states: "Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation within the program. 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), 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. 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.