Applied Statistical Analysis

EDUC 6050

Instructor:
Tyson S. Barrett, PhD
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435-797-0120
EDUC 456

Class:
Wed 4:30 - 7:15 pm
HPER 114

Office Hours:
Wed 3:00 - 4:15 pm

Materials:

Active Learning Approach (2nd Ed.). Sage Publications.

- Canvas (canvas.usu.edu) Please check Canvas frequently for course updates, assignments, & grades.
- Jamovi software (free and open source; similar to SPSS; downloading and installing are discussed in class)
- Optional: Scientific or statistical calculator (may be a graphic calculator, but NOT a cell phone, iPod, tablet, etc.)

Course Purpose:

This course is an applied introduction to statistical methods commonly used in educational, social, and health sciences. Coverage of data types, data base creation, data exploration and visualization; use of statistical software to compute descriptive and inferential statistics, including correlation, regression, group comparisons (t-tests, ANOVA), and categorical methods.

Essential Questions for this Course:

- What is quantitative research?
- How does data inform our world?
- How are data analyzed?

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.
Preparation & Attendance:

You should make every attempt to be at every class session. The activities, discussions, and demonstrations are designed to be helpful and insightful. Furthermore, the class lectures and activities will be absolutely essential for you to meet the requirements of some of the assignments in this course. However, as human beings, we sometimes get sick or have extenuating circumstances. If possible, make arrangements to obtain information covered in the course.

You are expected to participate in class activities and discussions. Research demonstrates that the quality of the classroom environment depends on the interaction of the students and the teacher. This class will be highly interactive and discussion-based. I believe if you give the effort to learn the material, you can gain analytic skills that will benefit you throughout your life.

Finally, you are expected to read all course material and have become familiar with course assignments. This preparation will make class time valuable and productive; otherwise, class assignments and examinations will be more difficult and time consuming.

Four Components of Your Grade:

I. Discussions, 30% of grade

By design, lectures are to enhance your understanding and experience with statistical concepts, rather than present them the first time. 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 questions and preparing students for assignments. To facilitate this, a discussion point of the assigned readings is due on the day the material is covered in class before the lecture time begins. This discussion point is to be posted on canvas and should include a summary of ideas from the readings, questions that you have regarding the material, or ways in which you can use the material in your research. Further, each student must respond to at least one other student's point.

Discussion points will be turned in electronically by 4:00 pm on the due date (see course schedule) via CANVAS, but preferably much earlier so as to allow fellow students to comment on or answer your discussion point.

These can be printed out and used as notes for the lectures and the exams.

II. Research Portfolio, 15% of grade

An important aspect of this course is discovering how statistics are used in your field. You must find a minimum of TEN journal articles in your field with a quantitative component (look for numbers). Create a grid (in Excel or Word) that states the author, year, journal, major research questions, the major constructs (IV or DV), the different statistical methods, and brief summary of findings. Finally, write a roughly two-paragraph response to each article on how the statistical information provided an insight into the research questions (in other words, what did we learn within these studies that we didn’t already know?). In addition, near the end of the semester we will have you share some of the more interesting articles that you found with the class.

III. Assignments, 30% of grade
SIX equally weighted assignments form the basis for learning the practice of statistics at the level required by this course. These assignments are based on analyzing data in Jamovi (or SPSS if you prefer). These use data that you collect (via a survey that we develop the first day of class) or any other data source that you are interested in. Part of the homework is done on Canvas (based on questions from the book’s “Practice Tests” at the end of each chapter) while the other part is done in Jamovi and turned in via Canvas. Both are due the same day at the same time.

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 11:59pm on the due date (see course schedule). Details on what is required to be turned in will be posted on canvas. Late assignments turned in within 24 hours of the due date will receive half the score earned. No points will be awarded thereafter.

IV. Examinations, 25% of grade

TWO equally weighted examinations will be given during this course. Examinations will be given IN CLASS and will require less than 60 minutes. Examinations will cover material discussed in class AND in the readings. All formulas needed will be provided on examinations (unless noted during examination reviews). Applicable statistical tables will also be provided where necessary. Calculators may be used, but not any electronic device that may transmit/receive, such as cell phones, iPods, tables, etc.

Both of the exams are REQUIRED: NO scores will be dropped. Examinations may consist of definitions, multiple choice questions, computations, output
interpretations, and short-answer essays. You may use your notes and homework during examinations. Only 60 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.

NOTE: Final is comprehensive but it will focus much more heavily on topics covered after the mid-term.

**Grading Criteria:**

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:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentages</th>
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<tbody>
<tr>
<td>A</td>
<td>&gt; 93%</td>
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<tr>
<td>A-</td>
<td>90 - 92%</td>
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<tr>
<td>B+</td>
<td>87 - 89%</td>
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<tr>
<td>B</td>
<td>83 - 86%</td>
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<tr>
<td>B-</td>
<td>80 - 82%</td>
</tr>
<tr>
<td>C+</td>
<td>77 - 79%</td>
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</table>
Advice for Success:

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 concerned about any math required in the course. Although statistics is a branch of mathematics, in this applied course we keep the level of mathematics to a bare minimum. 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. We utilize a new, free software that simplifies the use of the computer in statistics known as Jamovi. If you are familiar with Excel or any other spreadsheet service, Jamovi will be fairly natural to start using.

In addition to Jamovi, we will use some basic spreadsheet tools (Excel or Google Sheets will work great) to do some of the data work for us. Ultimately, this class is not a mathematics or a computer programming class.
but rather it is focused on helping you appreciate the basics of quantitative research so that you can best use it in your respective careers.

A final word of warning: Beware of technology misbehaving near deadlines. All assignments are to be turned in before the strict deadlines. Additionally, most assignments require some use of Jamovi or other software to complete them. It is never reliable to count on technology to come through at the last minute.

**Jamovi:**

In this course, we will use Jamovi for the computation. It is a blend between Microsoft Excel and IBM’s SPSS. The reason this software was chosen for this class is because:

1. It is free.
2. It is based on using a spreadsheet (which most of us are at least familiar with).
3. It is simplified so that only the analyses that you’ll be learning about are shown.
4. It has the ability to reproducibly and succinctly run any analyses that you will be needing throughout your research and/or analytic career.

Jamovi can be downloaded from [https://www.jamovi.org/](https://www.jamovi.org/). Again, it is free and works on PC, Mac, and Linux systems.

**Selected Policies & Procedures:**

**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.

**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.

The vast majority of USU’s students follow these guidelines.

**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:**

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.
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:

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

Tentative Schedule:

<table>
<thead>
<tr>
<th>Date</th>
<th>Readings and Such</th>
<th>Lecture Topic</th>
<th>Week</th>
<th>Assignment Due by 11:59pm</th>
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<tbody>
<tr>
<td>Jan 9</td>
<td></td>
<td>Syllabus, Textbook, data, and create your survey</td>
<td>1</td>
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<tr>
<td>Jan 16</td>
<td>Broman et al. (2017) – only sections 2-4, 6-8</td>
<td>Working with and Analyzing Data, Overview of Statistics, Intro to Statistics Terminology, Introduction to Jamovi</td>
<td>2</td>
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<tr>
<td>Jan 23</td>
<td>Ch 2, 3 Start looking for published research in your area</td>
<td>Statistics terminology (Hypothesis, IV and DV, Measurement, Validity and Reliability, Correlation and Experimentation, Distributions, Central Tendency and Variability)</td>
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<tr>
<td>Jan 30</td>
<td>Ch 4, 5, 6</td>
<td>Statistics terminology continued (hypothesis testing, populations and samples, descriptive and inferential statistics, effect sizes, confidence intervals, Type I and II errors)</td>
<td>4</td>
<td>HW #1 (Central)</td>
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<td></td>
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<td>More on Jamovi (data manipulation, transformations.)</td>
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<tr>
<td>Date</td>
<td>Chapter(s)</td>
<td>Topic</td>
<td>Week</td>
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<td>Feb 6</td>
<td>Ch 7</td>
<td>More on common (data manipulation, transformations, assumptions), Creating tables and figures for reports and manuscripts, Intro to t-tests</td>
<td>5</td>
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<td>Feb 13</td>
<td>Ch 7, 9, 10</td>
<td>T-tests (student’s, Mann-Whitney, Wilcoxon), Review of hypothesis tests</td>
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<td>Feb 20</td>
<td>Ch 11, 12</td>
<td>ANOVA (one-way, two-way), ANCOVA, Repeated Measures ANOVA, post-hoc analyses</td>
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<td>Feb 27</td>
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<td>Mid-Term Examination</td>
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<td>Mar 6</td>
<td>Ch 13</td>
<td>Correlations (Pearson, Spearman, partial)</td>
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<td>Mar 13</td>
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<td>Spring Break! (Do Not Come to Class)</td>
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<td>Mar 21</td>
<td>Ch 13</td>
<td>Linear Regression (hypothesis testing, prediction, assumptions)</td>
<td>10</td>
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<td>Mar 27</td>
<td>Ch 13</td>
<td>Multiple Regression (moderation, mediation)</td>
<td>11</td>
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<td>April 3</td>
<td>Ch 14</td>
<td>Categorical Data Analysis (Chi-square, logistic, log-linear, odds ratios)</td>
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<td>April 10</td>
<td>Ch 14</td>
<td>Categorical Data Analysis continued (logistic, odds ratios)</td>
<td>13</td>
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<td>April 17</td>
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<td>Research Portfolio, Review for final</td>
<td>14</td>
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<td>April 24</td>
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<td>Review (get ready for the final)</td>
<td>15</td>
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<td>May 1</td>
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<td>Final Examination</td>
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