

ASEN 5519: Special Topics – Experimental Design and Statistical Methods

Lecture: T/Th 2:00-3:15pm, ECCR 1B51

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1. Overview

This 5000 level graduate student course is aimed at examining the applied issues of designing experiments and performing statistical analyses to reach justified scientific conclusions. The approach will rigorously address the mathematical underpinnings of statistical tests and modeling through applied examples. Efficient and appropriate experimental design approaches will be integrated with statistical analysis techniques to enable application to real-world research questions. A special focus will be placed on the unique challenges of human subject experiments. Statistical software (e.g., R) will be used extensively.

A wide range of topics will be covered to provide a “one stop” overview of statistics for the engineer. This includes data visualization, hypothesis formulation, inferential statistics (e.g. t-test), briefly correlation and (multiple) regression, uncertainty and confidence intervals, ANOVA (fixed effects, random effects, and mixed), ANOVA-derived methods (e.g. ANCOVA, Nested designs), post-hoc comparisons and corrections, diagnostics and remedial measures, and best practices for reporting statistics in publication. Approaches and challenges that are common for human subject experiments will receive special attention, including repeated measures (within subjects) designs and analyses, outlier identification, non-parametric techniques, and small N approaches such as Bayesian statistics. Additional topics beyond the scope of the course will be touched upon to provide guidance for self-exploration of areas of interested for individuals’ research.

2. Assessment

Table 1 outlines the material by which student performance will be assessed. The primary evaluation components of the course will be homework and exams. There will also be a semester group project, with teams of up to 3 people performing an experiment with statistical analyses. This course will have 2 exams, but we will not use the time-slot assigned during finals week. Additional details on timeline and due dates can be found in the course schedule document.

Table 1: Distribution of course assessments

Exams (2)	30%
Homework (5)	50%
Semester Project	20%
	100%

3. Textbook

There is no required textbook for the class. An online version of the primary text, “Applied Linear Statistical Models” by Kutner, Nachtsheim, Neter, and Li, can be found here:

<https://mysite.science.uottawa.ca/rkulik/mat3378/mat3378-textbook.pdf>

Readings will be assigned from other resources as needed, and will be announced at least one week in advance of the due date.

4. Distance Students

This course requires the use of the Zoom conferencing tool, which is currently not accessible to users using assistive technology. If you use assistive technology to access the course material, please contact your faculty member immediately to discuss. To join synchronously, please use the following information:

Meeting ID: 954-348-408

Connection options:

Join via web browser: <https://cuboulder.zoom.us/j/954348408>

Join via Zoom app (using meeting ID)

Join via iPhone one-tap: US: +16699006833, 954348408#
or +16465588656, 954348408#

Join via telephone: US: +1-669-900-6833 or +1-646-558-8656

5. Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely

manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website \(www.colorado.edu/disabilityservices/students\)](http://www.colorado.edu/disabilityservices/students). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see [Temporary Medical Conditions](#) under the Students tab on the Disability Services website and discuss your needs with me.

6. Religious Holidays

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, if you need accommodations for an observance, please let me know at least 2 weeks prior to the date and I will work with you to come up with a reasonable solution. See the [campus policy regarding religious observances](#) for full details.

7. Classroom Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to me with your legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on [classroom behavior](#) and the [Student Code of Conduct](#).

8. Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy.

Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the [OIEC website](#).

9. Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to [the academic integrity policy](#). Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at the [Honor Code Office website](#).