



Analysis of Designed Experiments

STAT 5200/6200 (001), Fall 2026

[TODO: Check required syllabus statements at USU.] [TODO: Make sure all links go to USU, not ISU.]

Supplemental course website: https://jeswheel.github.io/5200_f26

Instructor Information

Jesse Wheeler
Mathematics and Statistics Department
Email: jesse.wheeler@usu.edu
Office: Ray B. West (RWST) 421
Office Hours: [TODO: Update office hours]

- Mondays 10:00 AM – 12:00 PM.
- Tuesdays 2:30 PM – 4:00 PM.
- Thursdays 2:30 PM – 4:00 PM.
- Also by appointment if necessary.

You can contact me during office hours or via Email. I will try my best to respond to questions within 24 hours during Mon-Fri. Feel free to email me over the weekends, but I may not be actively monitoring my emails during these times and you may have longer response times.

Graduate Teaching Assistant

Samitha Herath
Statistics Ph.D. Student
Email: samitha.herath@usu.edu
Office: [TODO: Where?]
Office Hours: [TODO: set office hours]

- Mondays 10:00 AM – 12:00 PM.
- Tuesdays 2:30 PM – 4:00 PM.
- Thursdays 2:30 PM – 4:00 PM.
- Also by appointment if necessary.

Course Description

This course teaches analysis of balanced experimental designs with fixed, random, crossed, and nested factors; factorial, nested, nested factorial, split plot, split block, and repeated measures designs; and fixed and mixed effects models, residual analysis, and post hoc mean comparisons. Additional coursework is required for those enrolled in the graduate-level course.

PREREQ: Earn a minimum grade of C- one of the following:

- STAT 2000, STAT 3000, DATA 3100, PSY 3010, SOC 3120

This course is 3 Credit Hours, and we meet every Tuesday and Thursday, 9:00 am - 10:15 am, Engineering 106, with the exception of university-observed holidays and breaks.

Course Objectives and Outcomes

[TODO: change]

- Students will use fundamental methods of point estimation.
 - Find optimal statistics and their distribution.
 - Assess biasedness, sufficiency, and completeness of a point estimator.
- Students will use the Neyman-Pearson theory of hypothesis testing.
 - Find optimal hypothesis tests.
 - Determine probabilities associated with Type I and Type II error.
- Students will identify confidence regions.
 - Students will apply various confidence methods to find confidence regions for random variable parameters.

Course Format

This is a standard class where we will meet in-person. All students are required to attend all classes during the first week. Any student having to miss during the first week needs instructor approval. Students will be dropped from their courses if they do not attend the first week and do not have permission from the instructor.

After the first week of classes, attendance is expected but will not be recorded. Lectures will not be recorded, but slides will be available to students who miss lecture. Course materials, activities, and assignments will be posted on Canvas.

Canvas

USU Canvas will be the primary tool for receiving announcements, assignments, and course lectures. Homework assignments will be uploaded to Canvas, along with an Canvas announcement that a new homework assignment has been posted.

The Canvas course will be broken down into separate modules, each representing a core topic for the course. In each module, there will be three basic resources for students:

- Lecture Slides
- Accompanying lecture notes
- Annotated Slides.

The lecture slides will be made available prior to the lecture. I will try my best to get them posted on Canvas the day before lectures, but as it is my first time teaching this course and I have to make the material from scratch, I may have some last minute changes the day of lectures. After our lectures, I will upload a version of the slides—with my own notes and comments—to a file called "annotated slides".

In addition to the lecture slides, there are accompanying lecture notes, which contain the same material as the slides, plus a little extra (e.g., solutions to certain in class problems).

Course Website

In addition to Canvas, course material will be available on my own personal course website. You may find this is easier to navigate course material, though using this website is not required. Access to the website will remain indefinitely after the course has concluded, whereas Canvas material may be lost once you graduate.

General course information can be found at the course website: https://jeswheel.github.io/5200_f26

Assessment Methods

[TODO: How many homeworks / exams?] Student understanding will be assessed via homework, one midterm exams, and a final exam.

Textbook and Course Materials

Oehlert, G. W., 2000. *A First Course in Design and Analysis of Experiments*. W. H. Freeman. ISBN: 0-7167-3510-5. .

This text is freely available online under a "Creative Commons" license: <http://users.stat.umn.edu/~gary/book/FCDAEdraft2021.pdf> Briefly, you are free to copy, distribute, and transmit the

text, provided that you properly attribute the work, do not use it for commercial purposes, and do not alter, transform, or build upon the work.

Software

For Stat 5200, you will likely need to use some statistical software to complete your homework assignments. I will provide example code and demonstrations using the  programming language; for the purpose of our class, think of this software as a special calculator used for Statistics. To interact with this software, I highly recommend using RStudio, an Integrated Development Environment (IDE) built for writing  code.

Why R? R and RStudio are both free, and widely used software in both academia and industry. R has been built specifically to help practitioners do statistics easily.

- Installing : <https://cran.r-project.org/>
- Installing RStudio: <https://posit.co/download/rstudio-desktop/>. Note that you should install  prior to installing RStudio.

Other types of calculators or programming languages are permitted, but it is not anticipated that they will be beneficial beyond what you can do in R.

Grading

[TODO: Settle on a grading scheme.]

Grade	Percentage Range
Homework	30%
Participation	5%
Midterm 1	20%
Final	30%

Table 1: Assignment Weights

The grading scale follows the USU standard scale, in Table 2.

Course Topics (Tentative)

We will closely follow the textbook, but not necessarily in the same order. Our tentative plan is:

[TODO: Update this]

- Parameter estimation

Grade	Percentage Range
A	93–100
A-	90–92.99
B+	87–89.99
B	83–86.99
B-	80–82.99
C+	77–79.99
C	73–76.99
C-	70–72.99
D+	67–69.99
D	60–66.99
F	0–59.99

Table 2: Grade Breakdown

- Method of moments estimators (Rice, 8.4)
- Maximum likelihood estimation (Rice, 8.5)
- Bayesian estimation (Rice, 8.6)
- Sufficiency, minimal sufficiency, and the invariance principle (Rice 8.8, Pawitan 3.1–3.2, Pawitan 2.8–2.9)
- Parameter uncertainty
 - Exact Intervals (e.g., Rice 8.5.3)
 - Revisiting Bayesian posteriors (Rice, 8.6)
 - Frequentist intervals
 - * The Score function and Fisher’s Information / Observed Information (Pawitan 2.5)
 - * Asymptotic properties of the MLE (Rice 8.5.2–8.5.3)
 - * Wald intervals (Rice 8.5.2–8.5.3, Pawitan 3.3)
 - Likelihood based intervals (Pawitan 2.6)
 - * Likelihood ratios
 - * Invariance / minimal sufficiency of likelihood (Pawitan 2.9)
 - * Profile likelihoods (Pawitan 3.4)
 - Cramér-Rao Lower Bound (Rice 8.7)
 - Bias and variance of point estimates (Pawitan 5)
 - * Reducing bias via Taylor series, jackknife, or bootstrap methods.
- Hypothesis testing (Rice 9.1–9.5, Casella and Berger 8.3)
 - Neyman-Pearson vs Fisher
 - Uniformly most powerful tests
 - Duality of confidence intervals and hypothesis tests.
 - Non-parametric tests
 - Chi-square tests
 - Criticisms of confidence intervals (Pawitan 5.10)

Schedule (Tentative)

The table below provides a tentative schedule of the course. This table will be updated on the course website as needed.

[TODO: Update]

Week	Dates (T Th)	Notes
1	Sep 1, 3	
2	Sep 8, 10	
3	Sep 15, 17	
4	Sep 22, 24	
5	Sep 29, Oct 1	
6	Oct 6, 8	
7	Oct 13, 15	
8	Oct 20, 22	
9	Oct 27, 29	Midterm 1
10	Nov 3, 5	
11	Nov 10, 12	
12	Nov 17, 19	
13	Nov 24, 26	Thanksgiving - No Class
14	Dec 1, 3	
15	Dec 8, 10	No-Test Week
16	Dec 14–18	Finals Week (Dec 17)

For other important dates and deadlines, please see the University academic calendar: <https://www.usu.edu/calendar/academic/?year=2026>.

Exams

[TODO: Midterm schedule]

- **Midterm 1:** Planned for **Feb 5**, during regular class time.
- **Final Exam:** Thursday, Dec 17, 9:30 a.m. – 11:20 p.m. The location will be our regular classroom, and the exam will be cumulative.

USU Final Exam Schedule Webpage

Homeworks

[TODO: Update this. Likely 8 HW assignments, plus participation]

There will be (approximately) weekly HW assignments, with due dates typically one week after assignment. On the week of the midterms and final exam, there will not be a homework assignment due. Late homework submissions will not be accepted, unless permission is provided by the instructor.

Homeworks will be 10 points total: 9 points for contribution (correct and original responses), 1 point for academic integrity. You can use any resources to help you with your homework, including the internet and generative AI. Before using outside sources, you are required to work on a given problem for at least one hour (honor-system).

The order of preferred sources are:

- Lecture Slides, Lecture Notes, and the Textbook.
- Office hours.
- Classmates.
- The internet (statoverflow).
- AI.

When looking for outside sources, please try your best to not search directly for a solution. To obtain full points for “academic integrity”, each homework assignment must include a statement at the start of the assignment indicating which sources they used, how long they worked on the problem before looking for alternative sources, and what they learned from the source they found. More details regarding the 1 academic integrity point can be found at https://jeswheel.github.io/5200_f26/rubric_homework.html

Quizzes

[TODO: Keep quizzes for participation?]

There may be periodic quizzes on Canvas. The point of these quizzes is to assess student comprehension and satisfaction with the course. Some questions will be knowledge based, others survey / opinion based. Students who complete the quizzes will be awarded full points, regardless of whether or not they answer questions correctly.

[TODO: All statements below were ISU required. Update this with USU required / recommended statements.]

Academic Complaints / Grievances

Students with academic complaints / grievances should first meet with the instructor responsible for the policy, procedure, or decision that resulted in the student’s initial complaint/grievance. If the student is still dissatisfied after that meeting, the student should next meet with the instructor’s department chair (Dr. Rault, PS 318B, patrickrault@isu.edu) and then with the dean of the

college (Dr. Widman, PS 120A, jameswidmann@isu.edu). For more information, see: <https://www.isu.edu/deanofstudents/advocacy-services/>.

Tutoring / Resources

[[TODO: Update link](#)] The following link to the University Tutoring website includes hours of operation, a link for online (Zoom) tutoring, and other information: <https://www.isu.edu/tutoring/>

Accessibility Statement

Our program is committed to all students achieving their potential. If you have a disability or think you have a disability (physical, learning disability, hearing, vision, psychiatric) which may need a reasonable accommodation, please contact Disability Services located in the Rendezvous Complex, Room 125, 282-3599 as early as possible.

Academic Integrity

Academic integrity is expected of all students. Academic dishonesty, including cheating or plagiarism, is unacceptable. The Idaho State University academic dishonesty policy allows an instructor to impose one of several penalties for cheating that range from a warning up to assigning a failing grade for the course or dismissal from the University. ANY use of an electronic device or other form of unauthorized materials during an exam or other assessment will be considered cheating.

For more information, see the ISU Policies and Procedures Student Conduct System. http://coursecat.isu.edu/undergraduate/academic_integrity_and_dishonesty_policy/

Title IX

Idaho State University is committed to fostering an environment in which students, faculty and staff from all backgrounds can live, work and learn free from the insidious and debilitating effects of prejudice, discrimination and marginalization. As such, ISU is committed to providing an environment free of all forms of discrimination, including sexual and gender-based discrimination, harassment, and violence such as sexual assault, dating violence, domestic violence, and stalking. If you (or someone you know) has experienced or is experiencing these types of behaviors, we have resources available to help.

ISU faculty and staff are concerned about the well-being and development of our students. If you inform me of any experience regarding harassment or discrimination, I (Jesse Wheeler) am obligated to share information with the ISU Title IX Coordinator to ensure that the student's safety and welfare is being addressed, consistent with the requirements of law. If you would like to talk to the Title IX Coordinator, Ian Parker directly, you may contact him at (208) 282-1439 or

ianparker@isu.edu, located in Rendezvous 235. If you would like more information regarding Title IX or to make an online report please visit the Title IX homepage at <https://www.isu.edu/title-ix/how-to-report/>.

Health and Safety on Campus

Idaho State University strongly encourages all individuals to receive a COVID-19 vaccine. Students who are experiencing COVID-19-like symptoms should not attend class in person. Individuals who are exhibiting symptoms of COVID-19 should contact University Health at (208) 282-2330 or their health care provider and complete the University's self-report form. Students are encouraged to notify faculty of illness and expected duration of absenteeism. Students are required to fully participate in the University's contact tracing process and follow all instructions related to quarantine and isolation.