STAT 512 Spring 2020

Course: **STAT 512: Experimental Design and Data Analysis for Researchers II**

Instructor: Kirsten E. Eilertson, PhD
206 Statistics Building
Assistant Professor of Statistics
Email: Kirsten.eilertson@colostate.edu, or through Canvas

Grader/TA: Xin Chen
Email: Xin.Chen@colostate.edu

Lecture: Clark A 206
Monday 2:00 – 3:50
Wednesday 2:00 – 3:50

On campus: attendance at lectures is expected
Distance: Don't get behind in viewing lectures

Office Hours: This course will rely primarily on the discussion board to address homework questions. I will also be available after lecture on Mondays to address questions from the resident students. For personal concerns, a student may email me to set up an appointment.

Pre-requisites: STAT 511

Software: STAT 512 will use R. R is a free software environment for statistical computing and graphics. To install R, go to www.r-project.org, and click on "download R", choose a CRAN mirror, and download R for your platform (binaries for base distribution).

We will also use RStudio, an IDE (integrated development environment). It is a program that makes it more convenient to work in R. Go to the website (www.rstudio.com) and download RStudio. We will use the free Desktop Open Source License.

Texts: **Required:** Ott and Longnecker, An Introduction to Statistical Methods and Data Analysis, 7th Edition, Duxbury, 2016. ISBN: 9781305269477

Expectations: Students are expected to spend at least two hours outside of formal instructional time on reading, homework and exam preparation for each contact hour. Expect to spend about 12 hours per week on this class, including lecture time.

Grading:

Homework	25%
Midterm 1 (See canvas for date)	30%
Midterm 2 (See canvas for date)	30%
Project	15%

Topics

1. Multiple Regression
    a. Basic model, assumptions, hypothesis testing, confidence and prediction intervals
    b. Polynomial terms, interactions, ANCOVA
    c. Model selection: stepwise selection and AIC/AICc/BIC
    d. Influence and collinearity diagnostics
    e. Generalized linear models: logistic and poisson regression
2. Fixed Effects models
    a. Blocked and latin square designs
    b. Factorial designs and pairwise comparisons
    c. Unbalanced and unreplicated designs
3. Mixed Effect models
    a. Random effects models
    b. Mixed models: crossed and nested factors, randomized complete block design, split-plot design, strip-plot design
    c. Repeated measures with one and two-factors

Homework format requirements:
Homework should be organized so that the grader can find your answers without searching through pages of computer output.

1. Answer questions concisely.
2. Write your own sentences to answer the question instead of just copying and pasting output. Only present the output that is related to the question. If the question does not require output, then do not include it.
3. R code is not necessary unless specifically requested.

Exams
Exams are open book, open notes. Calculator recommended.

Distance Learning Students: *This course requires a proctor for exams.* See additional details about proctoring on the last page of this syllabus. If you took STAT511 via distance in the Fall, the Statistics distance office will continue to use the proctor information on file from last semester. You do NOT need to resubmit the proctor form unless you want to use a different proctor. Exams may be taken any time during the exam window (see above). For any exam conflicts, please email the instructor at least one week prior to the scheduled exam date.

Final Project:
Students need to provide data for their project. Ideally this data would be part of your own research (or work) or at least from your lab (or company). The analysis for this project needs to focus on a topic from the course: multiple regression, factorial ANOVA or mixed models. Note that all of these topics include at least two predictor variables. Very small ($n \leq 10$?) and very large ($n > 1000$?) data sets are probably not a good fit for the project.

A (brief) project proposal will be due around Spring break. There will be at least one project review day toward the end of the semester, where students will discuss and review projects with each other. The final write-up will be due during finals week. I expect that the final write-up will be a few pages in length and include a detailed discussion of the variables, design, analysis, conclusions and some graphics as well as the code.

Academic Integrity

Your course work should represent only your ideas. I encourage discussion of homework in broad, conceptual terms where one student is trying to educate another without giving away the answer. Copying solutions or computing code from other students or any other source is an example of plagiarism. I want you to turn in work that you can honestly state is your own.

This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog and the Student Conduct Code. At a minimum, violations of academic integrity will result in a 0 on the assignment in question and a report to the Office of Conflict Resolution and Student Conduct Services. See the CSU TILT webpage for additional resources on this issue. If you ever have any questions about what constitutes academic dishonesty, please feel free to ask me.

Resources for Disabled Students

Support and services are offered to students with functional limitations due to visual, hearing, learning or mobility disabilities as well as to students who have specific chronic health conditions. See CSU's Resources for Disabled Students web page for more information. If you need specific accommodations due to a disability, please meet with me outside of class to discuss your needs as early in the semester as possible.

Universal Design for Learning:

I am committed to the principle of universal learning. This means that our classroom, our virtual spaces, our practices, and our interactions will be as inclusive as possible. Mutual respect, civility, and the ability to listen and observe others carefully are crucial to universal learning.

Need Help?

CSU is a community that cares for you. If you are struggling with drugs or alcohol and/or experiencing depression, anxiety, overwhelming stress or thoughts of hurting yourself or others please know there is help available. Counseling Services has trained professionals who can help. Contact 970-491-6053 or go to http://health.colostate.edu. If you are concerned about a friend or peer, tell someone by calling 970-491-1350 to discuss your concerns with a professional who can discreetly connect the distressed individual with the proper resources (http://safety.colostate.edu/tell-someone.aspx). Rams take care of Rams. Reach out and ask for help if you or someone you know is having a difficult time.

Distance Students (only):

How does exam proctoring work?

1. Students are responsible to identify their own proctor using these guidelines. If you live close to CSU, the CSU Testing Center will proctor for free but you still need to complete steps 2 and 3 below.
2. Submit proctor information using this form at least 2 days before the first exam (earlier is better). This information is used by the distance office so that they know where to send your exam. Do not download any other proctor forms you may find online. If you are using the CSU Testing Center, use this contact info for the form: Amanda Farmer, proctor@colostate.edu, Testing Coordinator.
3. Students are responsible to schedule an exam time directly with their proctor. The exam can be taken any time during a four day window. See above or Canvas calendar for dates. As long as the time is within the exam window, the instructor and distance office do not need to know the time of your exam. If you are using the CSU Testing Center, under "Schedule a Proctored Exam" choose Group "CSU Class", then "Paper Exam: 700 and 800 Online sections", 2 hour exam.
4. The day before the exam window begins (typically by noon), the distance office will send a pdf version of the exam to proctors. Students will receive a separate email at this time alerting them that the exam has been sent and including a cover sheet. If desired, you may fill out the cover sheet in advance and bring it with you to the exam.
5. When you take the exam, your proctor will provide a paper copy of the exam. The exam rules are the same as for local students. You may be asked to provide ID.
6. After the exam, your proctor is responsible to scan the exam and return it to the distance office. These instructions are provided directly to the proctors.
7. After the exams have been graded, your grade will appear in the Canvas grade book. Within 2 days of grading, the distance office will scan your graded exam and return it to you (using your official CSU email address).

Who should I contact with questions about an exam?

Contact the **Distance Office** (stats_ddp@mail.colostate.edu, (970)491-5268) if you have questions about:

- Proctoring: proctor form, changing proctors, etc.
- You did not receive the scanned copy of your graded exam (allow 2 days after grades are posted).

Contact **Instructor** (Kirsten.eilertson@colostate.edu) if you have questions about:

- Exam Grading
- If you cannot take the exam during the scheduled four day window.
- If you are scheduled to take the exam on a weekend and you have an emergency (ex: proctor did not receive the exam), contact Instructor via direct email (not Canvas) ASAP!
- If you live close to CSU and want to take the exam in class with the local students.