Statistical Methods II
STAT 220/ Spring 2024

Instructor: Adam Childers childers@roanoke.edu

Office: Trexler 270G

 Phone: 540-375-2449

Office Hours: 11:00-12:00PM, Tuesday, Thursday, and by appointment. Please send me an email to schedule an appointment if you need to meet at another time.

Zoom Link: https://roanoke-edu.zoom.us/j/5403752449

Meeting Time: 2:20 – 3:20 PM, Monday, Wednesday, Friday.

Meeting Place: Lucas 010

Required Text: The Statistical Sleuth – Third Edition by Ramsey and Schafer

Course Objective: The objective of this course is to understand how to use statistical methods to describe data and make statistical inferences. Building on the techniques from STAT 210 (or INQ 240), we will ask more sophisticated research questions and generalize our statistical methods. We will expand our understanding of simple linear regression by studying inferences for regression and multiple regression. We will take a closer look at one-way ANOVA and consider multiple comparisons. We will look carefully at assumptions for statistical methods and learn nonparametric methods to analyze data when the assumptions for the traditional tests are violated. We will also consider problems in big data and how to work with large data sets. Our focus throughout will be on statistic computing with R and clearly articulating our results in formal reports.

Intended Learning Outcomes: By the end of this course, students will be able to … …clearly
state a research question and pick an appropriate statistical method.
…describe the key features of a data set using graphical and numerical methods.
…understand general linear modeling including regression and ANOVA.
…understand how to design and experiment and determine sample size.
…determine when a nonparametric test is appropriate and how use them.
…articulate statistical methods and results to an audience of experts and non-experts.

Content:
- Drawing Statistical Conclusions
- Visualizing Data
- 2-sample inference
- Transformations
- Linear Regression
- ANOVA
- Contrasts
- Categorical Analysis
- Nonparametric Methods (Wilcoxin Rank Sum, Wilcoxin Signed Rank, Runs Test, Kruskal-Wallis) ▢ Logistic Regression
- R
- R Markdown

Tests: There will be four tests during the semester. They will be on
- February 12
- February 28
- April 1
- April 19

Technology: We will be using R and its companion integrated development environment RStudio throughout the semester. Both are free and can be downloaded from the internet. Please see Inquire for complete instructions on getting set up.

Structure of the course: We will be simultaneously being learning statistical methods covered in the book and how to implement them in R and R Markdown in class. Please bring your laptop with you to class every day.

Homework: Homework problem sets will be assigned regularly. The problems will be posted on Inquire with their due date. The homework will be graded for correctness and completeness. Additionally, there will be reading assignments, quizzes, and reflections.

Projects: Throughout the semester we will be completing data driven assignments that you will complete using the statistical software R. Your assignments are to be completed in R Markdown and will be graded for correctness, organization, and presentation.

Final Exam: The final exam will be cumulative and will be given on April 25 at 2:00 PM.

Grading: Grades will be assigned based on written assignments, tests, and a final exam.

Tests	50%
Homework/Projects	30%
Final Exam	20%

A tentative guideline for determination of grade will then be:

A	> 93	B	83 – 86.9	C	73 – 76.9	D	63 – 66.9
A-	90 – 93	B-	80 – 82.9	C-	70– 72.9	D-	60 – 62.9
B+	87 – 89.9	C+	77 – 79.9	D+	67 – 69.9	F	< 60

MCSP Conversation Series: Attending at least two MCSP conversation series events is required. Within one week of the lecture, a one-page reflection paper will be due and will count in your HW grade. You find the upload link on Inquire.

Attendance: Attendance is required and expected and is crucial to be successful in this course. An absence that is not discussed with the instructor prior to class is considered unexcused. Regardless of whether the absence is excused or not, you are responsible for all the material covered in class.

Missed Test: If you have to miss a test and have discussed it with me before the class takes the test, we can work together to re-schedule the test up to two days after the scheduled date. If it is not possible to take the test in that time period, I will replace that test grade with your final exam grade.

Make-up Work: No make-up work will be accepted. Any excused work will be replaced by the final exam. If an assignment is not turned in before the deadline and you have not contacted me about the assignment, it is considered unexcused.

Expected Hours of Work: This course expects you to spend at least 12 hours of work each week inside and outside of class.

Class Schedule: You can also find this on our Inquire page. Note, this is subject to change, but I will post any changes on Inquire.

Day	Date	Topic
W	17-Jan	Introduction
F	19-Jan	Intro to R and RStudio
M	22-Jan	Intro to R Markdown and the Tidyverse
W	24-Jan	1: Drawing Statistical Conclusions
F	26-Jan	2: t-tests
M	29-Jan	2: t-tests
W	31-Jan	3: Assumptions
F	2-Feb	3: Assumptions
M	5-Feb	4: t-test Alternatives
W	7-Feb	4: t-test Alternatives
F	9-Feb	4: t-test Alternatives
M	12-Feb	Test #1
W	14-Feb	5: Multiple Samples
F	16-Feb	5: Multiple Samples
M	19-Feb	5: Multiple Samples
W	21-Feb	6: Linear Combinations
F	23-Feb	6: Linear Combinations
M	26-Feb	6: Linear Combinations
W	28-Feb	Test #2
F	1-Mar	7: SLR
M	3-Mar	Spring Break
W	5-Mar	Spring Break
F	7-Mar	Spring Break
M	11-Mar	7: SLR
W	13-Mar	7: SLR
F	15-Mar	8 SLR Assumptions
M	18-Mar	8 SLR Assumptions
W	20-Mar	8 SLR Assumptions
F	22-Mar	9: Multiple Regression

M	25-Mar	9: Multiple Regression
W	27-Mar	9: Multiple Regression
F	29-Mar	No Class – Good Friday
M	1-Apr	Test #3
W	3-Apr	18 Proportions and Odds
F	5-Apr	18 Proportions and Odds
M	8-Apr	18 Proportions and Odds
W	10-Apr	19 Counts and Tables
F	12-Apr	19 Counts and Tables
M	15-Apr	20 Logistic Regression
W	17-Apr	20 Logistic Regression
F	19-Apr	Test #4
M	22-Apr	20 Logistic Regression
T	23-Apr	Review
R	25-Apr	Final Exam – 2:00 PM