Statistical Methods II
STAT 220/ Spring 2022

Instructor: Dr. Adam Childers / childers@roanoke.edu

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

Office: Trexler 270G

Phone: 540-375-2449

Office Hours: 9:40-10:40AM, Monday, Wednesday Friday, and by appointment. Please send me an email to schedule an appointment outside of these times. I'm happy to meet on Zoom or in-person.

Meeting Time: 12:00-1:00PM, Monday, Wednesday, Friday

Meeting Place: For the first two weeks of the semester, we will meet on Zoom synchronously and for the remainder of the semester we will me in-person in Trexler 263.

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

- Nonparametric Methods (Wilcoxin Rank Sum, Wilcoxin Signed Rank, Runs Test, Kruskal-Wallis)
- Logistic Regression
- R
- R Markdown
- The Tidyverse

Tests: There will be three tests during the semester. They will be on

- Wednesday, February 23
- Friday, March 25 Friday, April 20

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 the document "Getting Started with R" on 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: There will be reading assignments, problems assigned, and reflections. You can find all of them and their due dates on Inquire.

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. You can find the datasets on our course webpage at math.roanoke.edu/childers/STAT220.

Final Exam: The final exam will be cumulative and will be given on Monday, May 2 at 2:00-5:00PM.

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: I will not give make-up tests. If you miss a test and have discussed it with me before the class takes the test, I will use your final exam grade for replacement.

Make-up Work: No make-up work will be accepted. Any excused work will be replaced by the final exam.

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

Academic Integrity System: Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be your own work! All tests will be open book and open notes, but you cannot use any other resources to help you during a test unless I specifically tell you. Do not communicate with any person during a test except for me.

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.

Week	Day	Date	Topic
1	W	19-Jan	Introduction
1	F	21-Jan	Intro to R and RStudio
2	M	24-Jan	Intro to R Markdown and the Tidyverse
2	W	26-Jan	1: Drawing Statistical Conclusions
2	F	28-Jan	2: t-tests part 1
3	M	31-Jan	2: t-tests part 2
3	W	2-Feb	3: Assumptions part 1
3	F	4-Feb	3: Assumptions part 2 - transformations
4	M	7-Feb	4: t-test Alternatives
4	W	9-Feb	4: t-test Alternatives
4	F	11-Feb	4: t-test Alternatives
5	M	14-Feb	t-test documents
5	W	16-Feb	5: Multiple Samples
5	F	18-Feb	5: Multiple Samples
6	M	21-Feb	5: Multiple Samples
6	W	23-Feb	Test 1
6	F	25-Feb	6: Linear Combinations

7	M	28-Feb	6: Linear Combinations
7	W	2-Mar	6: Linear Combinations
7	F	4-Mar	7: SLR
*	M	7-Mar	Relax
*	W	9-Mar	Regroup
*	F	11-Mar	Reenergize
8	M	14-Mar	7: SLR
8	W	16-Mar	7: SLR
8	F	18-Mar	8 SLR Assumptions
9	M	21-Mar	8 SLR Assumptions
9	W	23-Mar	8 SLR Assumptions
9	F	25-Mar	Test 2
10	M	28-Mar	18 Proportions and Odds
10	W	30-Mar	18 Proportions and Odds
10	F	1-Apr	18 Proportions and Odds
11	M	4-Apr	19 Counts and Tables
11	W	6-Apr	19 Counts and Tables
11	F	8-Apr	20 Logistic Regression
12	M	11-Apr	20 Logistic Regression
12	W	13-Apr	20 Logistic Regression
12	F	15-Apr	No Class – Good Friday
13	M	18-Apr	Calculus Project
13	W	20-Apr	Test 3
13	F	22-Apr	Real Estate Project
14	M	25-Apr	Real Estate Project
14	T	26-Apr	Review
EXAM	M	2-May	EXAM 2:00PM