Statistical Methods I - STAT 210 - Fall 2024

Instructor: Adam Childers childers@roanoke.edu

Office: Trexler 270G

Phone: 540-375-2449

Office Hours: 11:00-12:00 PM, Tuesday, Thursday, and by appointment. You can email me to set up an appointment at a different time.

Meeting Time: 2:20-3:20 PM, Monday, Wednesday, Friday

Meeting Place: Trexler 374

Required Texts: *OpenIntro Statistics Fourth Edition* by David Diez, Mine Cetinkaya-Rundel, Christopher D Barr
I would recommend buying a physical copy buy you can download the electronic copy for free! You can find the book using the URL: https://www.openintro.org/stat/textbook.php

Course Objective: The objective of this course is to understand how to use statistical methods to describe data and make statistical inferences. We will start by learning how to collect data and design experiments. Next, we will focus describing data using graphical and numerical methods. Building our descriptive techniques, we will learn probability theory to understand how to make statistical inferences. Though out the course we will focus on statistical computing and clearly articulating our results.

Intended Learning Outcomes: By the end of this course, students will be able to …
…understand how to design an experiment and collect data.
…describe the key features of a data set using graphical and numerical methods.
…understand probability and how it relates to statistical inference.
…understand statistical inference and its limitations.
…clearly state a research question and pick an appropriate statistical method.
…use statistical software to organize and analyze data.
…articulate statistical methods and results to an audience of experts and non-experts.

Content:
- Producing Data
- Designing Experiment
- Graphical Methods (Histograms, Dot Plots, Pie Charts, Bar Charts, Box Plots, Stem and Leaf Plots, Scatterplots)
- Numerical Methods (Mean, Median, Standard Deviation, 5-Number Summary)
- Correlation and Linear Regression (OLS)
- Probability Models and Random Variables
- Probability Rules
- The Binomial Distribution
- The Central Limit Theorem
- Inferences for 1 and 2 Sample Proportions (z-tests)
- Inferences for 1 and 2 Sample Means (t-tests)
- Chi-Square Test
- ANOVA
- Simulation
- R
- R Markdown
- The Tidyverse

INQ 240: You cannot get credit for this course if you have taken INQ 240 as this course covers the same material. If you are in MCSP and have taken INQ 240, you need to take STAT 220 to fulfill your statistics requirement.

Structure of the course: We will be learning statistical methods covered in the book and how to implement them using the statistical software R. Many days we will be working together in R so please bring your laptop to class with you every day.

Homework: We will have daily HW on www.myopenmath.com. Each day there will be homework due the following class. Register at myopenmath to set up an account. Course ID: 244895. Enrollment key: RCSTAT.

Quizzes: We will have short quizzes occasionally to help prepare for the tests.

Labs: We will have serval labs throughout the semester that will focus learning statistical computing using R.

Tests: Tests will assess students understanding of material covered in class, take home readings, and homework assignments. The tests will be on

<div align="center">

Friday, September 20th
Wednesday, October 9th
Wednesday, November 6th
Wednesday, December 4th

</div>

Final Exam: The final exam will be cumulative and will be on Tuesday, December 10th at 2PM.

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

Tests	55%
Homework/Labs	30%
Final Exam	15%

Grades will be determined based on the following:

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 one 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 before 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.

Technology: Scientific calculators and the statistical programs R and RStudio will be used throughout the semester in the classroom and on assignments.

> R Download: https://www.r-project.org/
> RStudio Download: https://rstudio.com/products/rstudio/download/

We will be collecting data using the mobile application Classroom Stats though out the semester. Please download this free app onto your phone. It is available for Android and iOS and you can easily find it in the app store.

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! No electronic devices other than calculators can be taken out during any class or testing period (this includes cell phones) unless written consent is given by the professor (e.g. Mathematica may be allowed for some tests). Note that looking at or using your cell phone during a test or quiz is considered a violation of Academic Integrity regardless of your purpose or intent in doing so.

Subject Tutoring, located on the lower level of Fintel Library (Room 5), is open 4 pm – 9 pm, Sunday – Thursday. We are a Level II Internationally Certified Training Center through the College Reading and Learning Association (CRLA). Subject Tutors are friendly, highly-trained Roanoke College students who offer free, one-on-one tutorials in a variety of general education and major courses such as: Business, Economics, Mathematics, INQ 240, Modern Languages, Lab Sciences, INQ 250, and Social Sciences (see all available subjects at www.roanoke.edu/tutoring). Tutoring sessions are available in-person or online in 30 or 60-minute appointments (please specify if you prefer to meet with a tutor online or in-person when you make your appointment). All in-person appointments will maintain at least 6 feet of physical distance, desks will be cleaned between appointments, and masks must be worn in all indoor, public spaces. In the event that all classes go online this semester, Subject Tutoring will remain available online, too. Schedule an appointment at www.roanoke.edu/tutoring or contact us at 540-375-2590 or subject_tutoring@roanoke.edu. We hope to see you soon!

Schedule: This could change during this semester, but I will always let you know ahead of time.

Week	Day	Date	Topic
1	W	28-Aug	Introduction
1	F	30-Aug	Chapter 1: Intro to Data
2	M	2-Sep	Chapter 1: Intro to Data
2	W	4-Sep	Chapter 2.1: Numerical Data
2	F	6-Sep	Chapter 2.1: Numerical Data
3	M	9-Sep	Chapter 2.2: Categorical Data
3	W	11-Sep	R Lab: Summarizing Data
3	F	13-Sep	Chapter 3.1: Probability
4	M	16-Sep	Chapter 3.2: Conditional Probability
4	W	18-Sep	Review
4	F	20-Sep	Test 1
5	M	23-Sep	Chapter 4.1: The Normal Distribution
5	W	25-Sep	Chapter 4.1: The Normal Distribution
5	F	27-Sep	Chapter 4.3: The Binomial Distribution
6	M	30-Sep	Chapter 5.1 Point estimates
6	W	2-Oct	Chapter 5.2 Confidence intervals proportion
6	F	4-Oct	Chapter 5.2 Confidence intervals proportion
7	M	7-Oct	Review
7	W	9-Oct	Test 2
7	F	11-Oct	Chapter 5.3 Hypothesis Testing Proportion
*	M	14-Oct	Relax

*	W	16-Oct	Regroup
*	F	18-Oct	Reenergize
8	M	21-Oct	Chapter 5.3 Hypothesis Testing Proportion
8	W	23-Oct	Chapter 6.1 - Inferences for a Single Proportion
8	F	25-Oct	Chapter 6.2 Difference in proportions
9	M	28-Oct	Chapter 6.3 Goodness of Fit
9	W	30-Oct	Chapter 6.4: Test for Independence
9	F	1-Nov	R Lab: Inference for Categorical Data
10	M	4-Nov	Review
10	W	6-Nov	Test 3
10	F	8-Nov	Chapter 7.1 One-sample means
11	M	11-Nov	Chapter 7.1 One-sample means
11	W	13-Nov	Chapter 7.2 Paired Data
11	F	15-Nov	Chapter 7.3 Difference of 2 means
12	M	18-Nov	Chapter 7.5 ANOVA
12	W	20-Nov	R Lab: Inference for Numerical Data
12	F	22-Nov	Chapter: 8.1 Linear Regression
13	M	25-Nov	Chapter: 8.2 Least Squares
13	W	2-Dec	R Lab: Regression
13	F	4-Dec	Test 4
14	M	6-Dec	Review
14	T	11-Dec	Exam 8:30AM