Statistical Methods II
STAT 220/ Spring 2026

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Office Hours: 12:00-1:00 Monday, Wednesday, 10:00-11:00 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: 2:20-3:20PM, Monday, Wednesday, Friday.

Meeting Place: Trexler 374

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

Course Objective: This course focuses on using statistical methods to describe data and make statistical inferences. Building on techniques from STAT 210 (or INQ 240), we will ask more sophisticated research questions and develop more general statistical methods. We will expand our study of simple linear regression to include inference for regression and multiple regression, and we will take a deeper look at one-way ANOVA, including multiple comparison procedures.

Throughout the course, we will examine the assumptions underlying statistical methods and learn nonparametric techniques for analyzing data when traditional assumptions are violated. We will also consider challenges associated with large data sets and introduce strategies for working with big data. Our emphasis throughout will be on statistical computing with R and on clearly communicating results through well-organized, formal statistical reports.

Intended Learning Outcomes: By the end of this course, students will be able to:

- Clearly state a research question and select an appropriate statistical method.
- Describe the key features of a data set using graphical and numerical summaries.
- Understand and apply general linear models, including regression and analysis of variance (ANOVA).
- Design experiments and determine appropriate sample sizes.
- Determine when nonparametric methods are appropriate and apply them correctly.
- Clearly communicate statistical methods and results to both technical and non-technical audiences.

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 three tests during the semester.

Technology: We will use 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.

Structure of the course: We will be simultaneously 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/Quizzes: 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.

Project: There will be a group project with a presentation for the class. The project will ask an interesting research question and use statistical methods to answer it. There must be one new topic not covered in class in the report. The project will consist of a written report and a presentation for the class.

Final Exam: The final exam is cumulative and is on April 23 at 2PM.

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

Tests	45%
Homework/Quizzes	20%
Project/Presentation	15%
Final Exam	20%

A tentative guideline for the 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				

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 must 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 period, I will replace that test grade with your final exam grade.

Make-up Work: Make-up work can be turned in up to 2 days after it is originally due but will have a 25% penalty.

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! I encourage collaboration on homework, but when you write up your solutions you should never be looking at someone else's work. 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. If you use generative AI in any way on an assignment, you need to specify exactly how you used it, or it will be considered an Academic Integrity Violation.

Class Schedule: This is our tentative schedule. I will update changes on Inquire.

Day	Date	Chapter	Title
M	Jan 12	-	Introduction
W	Jan 14	Ch. 1	Statistical Inference and Study Design
F	Jan 16	-	Intro to R and RStudio
M	Jan 19	-	MLK Day – No Class
W	Jan 21	-	R Markdown and tidyverse
F	Jan 23	Ch. 2	t-Tools
M	Jan 26	Ch. 2	t-Tools
W	Jan 28	Ch. 3	Robustness and Resistance
F	Jan 30	Ch. 3	Transformations
M	Feb 2	Ch. 4	Nonparametric Methods
W	Feb 4	Ch. 4	Nonparametric Methods
F	Feb 6	Ch. 4	Nonparametric Methods
M	Feb 9	-	Review for Test 1
W	Feb 11	-	Test 1
F	Feb 13	Ch. 5	Comparing Several Means (ANOVA)
M	Feb 16	Ch. 5	One-Way ANOVA
W	Feb 18	Ch. 5	ANOVA Diagnostics
F	Feb 20	Ch. 6	Contrasts
M	Feb 23	Ch. 6	Multiple Comparisons
W	Feb 25	Ch. 7	Simple Linear Regression
F	Feb 27	Ch. 7	Least Squares and Residuals
M	Mar 2	-	Spring Break – No Class
W	Mar 4	-	Spring Break – No Class
F	Mar 6	-	Spring Break – No Class
M	Mar 9	Ch. 7	Inference for Regression
W	Mar 11	-	Review for Test 2
F	Mar 13	-	Test 2
M	Mar 16	Ch. 8	Regression Diagnostics
W	Mar 18	Ch. 8	Transformations in Regression
F	Mar 20	Ch. 8	ANOVA for Regression
M	Mar 23	Ch. 9	Multiple Regression
W	Mar 25	Ch. 9	Indicators and Interactions
F	Mar 27	Ch. 18	Difference in Two Proportions
M	Mar 30	Ch. 18	Odds Ratios
W	Apr 1	Ch. 18	Odds Ratios
F	Apr 3	-	Good Friday – No Class
M	Apr 6	Ch. 20	Logistic Regression
W	Apr 8	Ch. 20	Logistic Regression Inference
F	Apr 10	-	Review for Test 3
M	Apr 13	-	Test 3
W	Apr 15	-	Project Workshop
F	Apr 17	-	Presentations
M	Apr 20	-	Presentations
T	Apr 21	-	Presentations
R	Apr 23		Exam at 2PM