

STAT 304 - Applied Linear Regression  
STAT 304/ Spring 2023

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Office Hours: 12:00-1:00PM, Monday, Wednesday Friday, and by appointment. I'm available to meet at other times; please send me an email to schedule an appointment.

Meeting Time: 10:50-11:50AM, Monday, Wednesday, Friday

Meeting Place: Olin 230

Required Text: Regression Analysis by Example 5<sup>th</sup> Edition, by Chatterjee and Hadi.

Course Objective: The objective of this course is to understand how to create and analyze models to extract information contained in a set of data. In our study of applied linear regression, we will become familiar with statistical software and learn how to apply it to problems in regression analysis. Further, we will learn how to effectively communicate our statistical findings in a manner that is both appropriate for our intended audience and technically precise.

Intended Learning Outcomes: By the end of this course, students will be able to ... ..understand how to select and interpret a statistical model.

...understand the connections between regression analysis and the design of experiments.

...effectively communicate the information contained in a set of data using regression analysis.

...understand the role statistical software plays in regression analysis.

...understand the limitations of regression analysis and the assumptions necessary to use it.

Content: We will cover most of chapters 1 through 12 in the text. Included in these chapters is:

- Simple Linear Regression
- Multiple Linear Regression
- Regression Diagnostics
- Using Qualitative Variables as Predictors
- Transformations of Variables
- Weighted Least Squares
- Analysis of Collinear Data
- Variable Selection Procedures
- Lasso and Ridge Regression
- Logistic Regression

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

- Wednesday, February 22<sup>nd</sup>
- Monday, March 20<sup>th</sup>
- Monday, April 17<sup>th</sup>      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 instructions on getting set up.

Homework: There will be reading assignments, problems assigned, 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 Friday, April 28 at 8:30AM.**

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

Tests	40%
Assignments	40%
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: Attendance 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.

Technology: We will use R, R Studio, and R Markdown in class and on assignments.

Academic Integrity System: The Roanoke College Academic Integrity System applies to all graded work in this course. Students are responsible for understanding and adhering to the Academic Integrity System. Among other things the Academic Integrity System prohibits giving or receiving unauthorized aid, assistance, or unfair advantage on academic work. Please note that having a phone or unauthorized electronic device out during a test is an academic integrity violation.

Week	Day	Date	Topic
1	W	18-Jan	Introduction
1	F	20-Jan	Intro to R
1	M	23-Jan	Intro to RStudio
2	W	25-Jan	1: Introduction
2	F	27-Jan	2: SLR
2	M	30-Jan	2 SLR
3	W	1-Feb	2: SLR
3	F	3-Feb	3: MLR
3	M	6-Feb	3: MLR
4	W	8-Feb	3: MLR
4	F	10-Feb	4: Diagnostics
4	M	13-Feb	4: Diagnostics
5	W	15-Feb	5: Qualitative Predictors
5	F	17-Feb	5: Qualitative Predictors
5	M	20-Feb	5: Qualitative Predictors
6	W	22-Feb	Test 1
6	F	24-Feb	6: Transformations
6	M	27-Feb	6: Transformations
7	W	1-Mar	6: Transformations
7	F	3-Mar	8: Correlated Errors
8	M	13-Mar	8: Correlated Errors
9	W	15-Mar	9: Collinear Data
9	F	17-Mar	9: Collinear Data
9	M	20-Mar	10: Working with Collinear Data
10	W	22-Mar	10: Working with Collinear Data
10	F	24-Mar	Test 2
10	M	27-Mar	10: Working with Collinear Data

11	W	29-Mar	11: Variable Selection
11	F	31-Mar	11: Variable Selection
11	M	3-Apr	11: Variable Selection
12	W	5-Apr	Lasso Regression
12	F	7-Apr	Lasso Regression
12	M	10-Apr	12: Logistic Regression
13	W	12-Apr	12: Logistic Regression
13	F	14-Apr	12: Logistic Regression
13	M	17-Apr	Project
14	W	19-Apr	Project
14	F	21-Apr	Project
14	M	24-Apr	Test 3
14	T	25-Apr	Review
14	R	24-Apr	Project