

Math 588, Fall 2017
Methods of Data Analysis
Classroom: Weir 209
Days & Time: 9:30-10:45

Instructor: Dr. Anwar Hossain

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Office Hrs: TR: 8:15- 9:15am; Friday: 8:30-11am Or By Appointment

Text Book: The Statistical Sleuth: A Course in Methods of Data Analysis by Ramsey and Schafer; Third edition

Course Learning Outcomes:

The purpose of this course is to familiarize you with commonly used data analytic techniques. The statistical packages SAS and R will be used for calculations. This course is design for those in Mathematics or other fields that need to use Statistical methods to analyze data from experiments and observational studies and who need to communicate the results to others. It is intended as a course for students who are preparing to design, implement, analyze, and report their research. You will improve your understanding of statistical reasoning, measures of uncertainty, the general tools, and the spirit of statistical data analysis, which will be useful for a wide range of problems.

Program Learning Outcomes:

Learning objectives for the Math Department's undergraduate and graduate degree programs can be found at

<http://infohost.nmt.edu/~math/about/learningoutcomes.html>

Course requirements:

This course will be presented by using lectures, in-class exercises, and discussions. Students are expected to attend all class periods and be fully prepared for each class. While in class, please turn off your cell phone, iPods, and other music devices. You are responsible for all material assigned in the text and all the material in class. Regular class attendance is strongly recommended. The course is a cumulative course- for this reason do not fall behind and always do the homework!

Exams: There will be a mid term and a comprehensive final exam during final week

Distribution of Scores:

Mid term	: 35%
Home Work:	30%
Final exam	: 25%
Term Paper	: 10%

Total	: 100%

A BRIEF OVERVIEW OF TOPICS:

1. SAS and R
2. Simple Linear regression (chapter 7)
3. Introduction to Multiple Linear Regression (chapter 9)
4. Inferential tools for multiple regressions (chapter 10)
5. Model checking and Refinement (chapter 11)
6. A Taste of Model Selection for Multiple Linear Regression (chapter 12)
7. Experimental Design: One and Two Factor Designs (chapter 13)
8. Repeated Measures and other multivariate responses (chapter 16)
9. Exploratory tools for Summarizing Multivariate Response (chapter 17)
10. Comparisons of proportions or odds (chapter 18)
11. Logistic Regression for Binary Response Variables (chapter 20)
12. Logistic Regression for Binomial Counts (chapter 21)
13. Log-linear Regression for Poisson Counts (chapter 22)
14. Power Analysis

Homework, Fall 2017

- HW#1 Text book problems: 2.13, 2.19, 2.20, 2.21, 3.22
HW#2 Text book problems: 4.16, 4.19, 4.28
HW#3 Text Book Problems: 5.17, 5.19
HW#4 Text book problems: 7.14, 7.17, 7.27, 8.17
HW#5 Text book problems: 9.14, 9.15, 9.16, 10.13, 10.14
HW#6 Text book problems: 11.11, 11.12, 11.15, 11.20, 12.14
HW#7 Text book problems: 12.15, 13.19 and the following two problems

1. In an experiment conducted to determine which of 3 missile systems is preferable, the propellant burning rate for 24 static firings was measured. Four different propellant types were used. The experiment yielded duplicate observations of burning rates at each combination of the treatments. The data after coding, are given below:

		Propellant Burning Rates			
		Propellant Type			
		B1	B2	B3	B4
Missile System	A1	34.0	30.1	29.8	29.0
		32.7	32.8	26.7	28.9
	A2	32.0	30.2	28.7	27.6
		33.2	29.8	28.1	27.8
	A3	28.4	27.3	29.7	28.8
		29.3	28.9	27.3	29.1

- a. Perform an analysis of variance tests for all main and interaction effects using 5% significance level.
- b. Perform multiple comparisons tests for the means.

2. The table below contains data from an experiment designed to study the effect of 2 factors on the quality of pancakes. The factors were the amount of whey (0%, 10%, 20% and 30%) and whether or not a supplement was used. Three pancakes were baked for each of the 8 combinations of whey and supplement. Each pancake then was rated by an expert and the 3 ratings averaged to get one overall quality rating. The higher the quality, the better the pancake. The experiment was repeated 3 times. Data on quality of pancakes

	Amount of Whey			
	0%	10%	20%	30%
No Supplement	4.4	4.6	4.5	4.6
	4.5	4.5	4.5	4.7
	4.3	4.8	4.8	5.1
Supplement	3.3	3.8	5.0	5.4
	3.2	3.8	5.3	5.6
	3.1	3.6	4.8	5.3

- Provide a 2-way ANOVA table for these data
- Test for presence of interaction between Whey and Supplement. Also test for presence of main effects.
- Provide an interaction plot for these data
- Provide a discussion of the effect of Supplement and amount of Whey on the quality of pancakes.

HW#8 Text book problems: 16.10, 16.12, 17.9, 17.10
 HW#9 Text book problems: 18.9, 18.12, 18.13, 19.12
 HW# 10 Text book problems: 20.10, 20.11, 20.12, 21.10, 21.13
 HW# 11 Text book problems: 21.15, 21.16, 22.15, 22.16, 22.22