960:384 , 960:484– Intermediate Statistical Analysis , Basic Applied Statistics– Spring, 2022

Course Information

Prerequisite: A first course in statistics, or a course in probability. Please inform the instructor if you are meeting this prerequisite with a probability course.

3:50-5:10 MW LSH B117

Office Hours: M 2:30-3:30 BE 013, W 2:15-3:15 Hill 476, Tu 9-10pm Zoom

Course Description:

384: Application of statistical techniques to the analysis of data; tests of significance, correlation and regression analysis, confidence intervals, analysis of variance and some design of experiments, analysis of cross-classified data, chi-square tests.

484: Estimation, hypothesis testing, chi-square methods, correlation and regression analysis, basis of design of experiments.

Instructor: John E. Kolassa ☎ (848) 445-7674, kolassa@stat.rutgers.edu

Text: *Probability and Statistics for Engineering and Science*, by Devore, Jay, Edition 9, Cenage.

Computing: The R language will be used for class demonstrations and homework. The program is available for free download on almost all computing platforms.

Academic Integrity: All students are responsible for locating, reading, and abiding by the University Policy on Academic Integrity for Undergraduate and Graduate Students. The policy is available on-line at http://nbacademicintegrity.rutgers.edu/home/academic-integrity-policy/ . This document forbids plagarism and requires

1. That all scholars acknowledge and cite all use of ideas, results, or words of others.
2. That all scholars acknowledge all contributors to a given pice of work.
3. That all work submitted is produced without the aid of unsanctioned assistance.
4. That all other scholars are treated in an ethical manner, and specifically not assisted in dishonesty nor obstructed in their work.

Students are explicitly permitted to work collaboratively on homeworks. Students working on exams may not consult with any other person, including electronically, and may refer only to a small quantity of notes announced by the instructor before each exam. Most of the homework assignments will involve reanalysis of publicly-available data sets. I do not expect that students will research previous published analyses of these data sets, but if any is consulted, they must be referenced.

Assessment: There will be two midterm exams, each worth 20% of the final grade. A final exam will be worth 20% of the final grade, and homework assignments, with the lowest dropped, will be worth 30% of the final grade.

Objectives:

1. Students will be able to choose appropriate statistical techniques suited to a particular research question, and will be able to interpret the results of these techniques in light of their research question.
2. Students will be able to perform standard statistical computations to perform the analysis selected in 1.

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Projected Schedule and Syllabus

Wk	Day	Date	*Topics*	*Homework*	*Readings*
1	WE	19 Jan	Sample Spaces, Probability Axioms, Tool for Calculating Probabilities, Dependence and Conditional Probability		D §2.1, 2.2, 2.3, 2.4
2	MO	24 Jan	Independence, Discrete Random Variables, Expectation, Continuous Random Variables		D §2.5, 3.1–3.2, 3.3, 4.2, 4.1
	WE	26 Jan	Binomial Distribution, Hypergeometric Distribution, Normal, Joint Distributions, Covariance and Correlation, Sampling Distributions		D §3.4, 3.5, 4.3, 5.1, 5.2, 5.3-5.4
3	MO	31 Jan	Data Sources, Describing Data, Measures of Location, Measures of Spread		D §1.1, 1.2, 1.3, 1.4
	WE	2 Feb	Hypothesis Testing for a Population Expectation, Tests for a Single Population Expectation, Testing a Mean without Knowing the Standard Deviation, One-sample binomial testing, Statistical vs. Practical Significance, Multiple Tests	HW-1 due	D §8.1, 8.2, 8.3a, 8.4, 8.5a, 8.5c
4	MO	7 Feb	Estimation and Confidence Intervals, Confidence Interval as Inversion of Test		D §7.1-7.2, 8.5b
	WE	9 Feb	Power and Sample Size Selection		D §8.3b
5	MO	14 Feb	Two-sample inference: Independent Samples, Two-sample inference: Matched pairs, Two-sample inference: Independent Samples for Proportions		D §9.1-9.2, 9.3, 9.4
	WE	16 Feb	Single-Factor Analysis of Variance, Multiple Comparisons	HW-2 due	D §10.1-3
6	MO	21 Feb	Multi-Factor Analysis of Variance Without Replicates, Multi-Factor Analysis of Variance With Replicates		D §11.1, 11.2
	WE	23 Feb	Regression Introduction, Least Squares Estimation		D §12.1, 12.2
7	MO	28 Feb	Exam		
	WE	2 Mar	Parameter Inference		D §12.3
8	MO	7 Mar	Fitted and Predicted Values	HW-3 due	D §12.4
	WE	9 Mar	Regression and Correlation		D §12.5
9	MO	14 Mar	Model Checking		D §13.1
	WE	16 Mar	No Class		
10	MO	21 Mar	No Class		
	WE	23 Mar	Transformation to linearity, Multiple Regression, and Influnece and Outliers		D §13.2, 13.4
11	MO	28 Mar	Polynomial Regression	HW-4 due	D §13.3
	WE	30 Mar	Categorical Variables		D §14.1
12	MO	4 Apr	Exam		
	WE	6 Apr	Association in Tables		D §14.3
13	MO	11 Apr	One-sample median methods		D §15.1
	WE	13 Apr	Two-Sample Testing via the Wilcoxon Rank Sum Test	HW-5 due	D §13.2
14	MO	18 Apr	K-Sample Methods		D §15.4
	WE	20 Apr	Quality Control Charts		D §16.1-16.2
15	MO	25 Apr	More Control Charts		D §16.3-16.4
	WE	27 Apr	CUSUM and acceptance testing	HW-6 due	D §16.5-16.6
16	MO	2 May	Review		
	WE	4 May	No Class – Reading Day		