INQ 240E-1, Fall 2018: Statistical Reasoning: Here's to your Health!

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Class Meetings: Tuesdays and Thursdays 4:30 - 6:00 PM, 374 Trexler Hall

Office Hours: after class and by appointment (email or call me - take advantage of this)

Course Information

This is a course in learning how to obtain and interpret results obtained from sets of data by using techniques of statistics. This class will introduce to you the methods of collecting, organizing, and presenting data. You will also study various quantitative measures for data and will learn how to draw conclusions and make inferences from that data. Some probability will also be discussed as a precursor to the "inferential" statistics.

Intended Learning Outcomes

By the end of this course, successful students will be able to:

- use the methodologies of statistics to investigate a topic of interest and make decisions based on the results,
- use the methodologies of statistics to design and carry out a simple statistical experiment,
- use the methodologies of statistics to critique news stories and journal articles that include statistical information,
- articulate the importance and limitations of using data and statistical methods in decision making,
- write about course topics clearly and effectively, and
- interpret quantitative information related to the course topic.

Required Materials

Textbook: Essential Statistics, by David Moore, First Edition W.H. Freeman

In-class Tools: Introductory Statistics by Illowsky and Dean, Download for free at https://openstax.org/details/books/introductory-statistics and Minitab Express statistical software package. Rental available at https://estore.onthehub.com

Reference Book: Easy Writer by Andrea Lunsford

RC Edition Calculators: Any scientific calculator to perform arithmetic calculations (and square roots)

Other: Other readings will be provided as needed

Course Grades

The following table lists the weights for the various forms of assessment for this class.
Quizzes 15% Projects 20% Tests 44% Final Exam 21%
A grade scale will be determined after final grades are computed, but will be no worse than the scale below:

A 93-100	A- 90-92	
B+ 87-89	B 83-86	B- 80-82
C+ 77-79	C 73-76	C- 70-72
D+ 67-69	D 63-66	D- 60-62
F 0-59		

Overall Workload

This course expects you to spend at least 12 hours of work each week inside and outside of class.

Homework Notebook

Homework is assigned regularly in this class and will be routine problems from the main textbook that serve as good examples to use in class to reinforce certain topics. Homework will not be collected, but rather you will be required to keep your homework solutions in a dedicated binder for this class. Time during each class will be dedicated to a discussion of homework problems (if students bring questions they have). Completing homework and doing problems is the best way to become familiar with the material!

As a "reward" for completing the homework, you will be allowed to use your homework notebook during most quizzes (unless announced by the instructor the class period before, using your homework notebook is fair game for a quiz). In addition, you will be allowed to reference and use your homework notebook during the last 20 minutes of each test and for a 40 minute period during the final exam.

Your homework notebook must not have any materials other than the homework that you have worked on, and the contents of your homework notebook should be in your own handwriting (and original, not photocopied)! They are subject to inspection at any time.

Quizzes: There will be weekly quizzes in this class, given at the end of class on the "wrap-up" day. Generally, these quizzes will have two problems, one each from the roughly two chapters that we discuss during the previous two days. Remember, you will most often be able to use your homework notebook during these quizzes.

Tests: There will be four tests this semester; the tests will focus primarily on the statistics content of this course but will emphasize critical thinking and writing! Homework and class notes are absolutely the best sources of review! The tests will not be designed to be cumulative, but as with any course involving mathematics, material from previous tests can be thought of as a prerequisite for future tests. Remember, you will be allowed to use your homework notebook during the final 20 minutes of each test!

Other Assignments

There will be two major projects in this class that are designed to allow some freedom for you to explore the connection between statistics and health topics.

The first of these assignments will be a Public Service Announcement: (Small Group Assignment) Produce a video in the style of a public service announcement regarding a health issue. The message of the announcement must be supported by solid statistical research. The research must be mentioned in the video and justified in written form.

The second of these assignments will be a Statistical Experiment & Report: Design and carry out a simple study related to a health issue and analyze the results.

Reading: Daily reading of assigned sections from our textbook is expected. You should come to class prepared to discuss the material that you have read. Our anticipated schedule is outlined on this syllabus, but this is subject to change and all assignments will be announced in class and posted on Inquire. Readings from other sources will be assigned as appropriate.

Final Exam: The final exam will be comprehensive and given from 6:30 PM to 9:30 PM on Tuesday, December 11. As with the tests, it will emphasize critical thinking and writing. The best way to review for the final is to review your performance on the four tests; focus on material that you did not master the first time around and review the topics

that you did master. Remember that you will be able to use your homework notebook during 40 minutes in the middle of the final exam.

MCSP Conversation Series

The Department of Mathematics, Computer Science and Physics offers a series of discussions that appeal to a broad range of interests related to these fields of study. These co-curricular sessions will engage the community to think about ongoing research, novel applications and other issues that face our discipline. Members of this class are invited to be involved with all these meetings; however, participation in at least one of these sessions is mandatory. After attending, students will submit a one-page paper reflecting on the discussion. This should not simply be a regurgitation of the content, but rather a personal contemplation of the experience. This reaction paper will be counted as a quiz.

Attendance & Make-Up Work

Attendance is critical to the understanding of the material in the course; it is both required and expected. Any absence that is not discussed with the instructor prior to the missed class is considered unexcused. When absent, excused or unexcused, you are responsible for all material covered in class. You will not be allowed to make up any work missed due to an unexcused absence.

Inquire Policy

Students are required to be knowledgeable of all postings on Inquire. It is each student's responsibility to consistently monitor Inquire for course information. This means every day! Any assignment that requires an Inquire upload will not be accepted in any other form. Also, to receive credit for uploads, the file must be readable on the instructor's college computer. It is the student's responsibility to make successful submissions. It is the student's responsibility to resolve technology problems through the college's IT department.

Academic Integrity

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; please turn them off before class). 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.

Course Schedule

The following schedule is approximate and subject to change. This mainly lists the statistics topics to be covered, project time lines, tests, and quizzes. Other readings will be assigned when appropriate and will more or less be tied to specific projects. Homework problems to work on for your homework binder are listed with each section.

Question 1: How do we properly convey health information and data in an unbiased and informative way?

Tues	Aug 28	Chapter 1	Picturing Distributions with Graphs Homework: C1 #19, 20, 25, 26, 27, 28
Thurs	Aug 30	Chapter 2	Describing Distributions with Numbers; **Project 1 Begins** Homework: C2 #20, 29, 31, 34, 35

Tues	Sep 4	Chapter 3	The Normal Distributions
			Homework: C3 #22, 26, 27, 29, 31, 32, 36

Question 2: Can we use data and statistical techniques to make lifestyle and healthcare recommendations?

Thurs	Sep 6	Chapter 4	Scatterplots and Correlation, **Quiz 1**
			Homework: C4 #19, 29, 31, 32
Tues	Sep 11	Chapter 5	Regression
			Homework: C5 #23ab, 24, 25, 28, 38, 39, 41
Thurs	Sep 13	Chapters 7, 8	Producing Data: Sampling and Experiments, **Quiz 2**,
			Homework: C7 #20, 28, 38; C8 #25, 33, 38a
Tues	Sep 18	Chapter 9	Introducing Probability, **Review for Test**
			Homework: C9 #25, 29, 31, 32, 35, 37, 41, 42, 44, 47
Thurs	Sep 20	**Test 1:** Chapters 1-5, 7	

Question 3: How accurate, overall, is the information we see in the media?

Tues	Sep 25	Chapter 10	Sampling Distributions, **Project 1 Due**
			Homework: C10 #17, 19, 20, 21, 24, 28, 31, 32
Thurs	Sep 27	Chapter 11	General Rules of Probability **Quiz 3**, **Project 2 begins**
			Homework: C11 #23, 24, 25a, 27, 34, 35, 39, 41, 42
Tues	Oct 2	Chapter 12	Binomial Distributions, **Review for Test 2**
			Homework: C12 #20, 21, 27, 32, 33, 38
Thurs	Oct 4		**Test 2:** Chapters 9-12
Tues	Oct 9	Chapter 13	Introduction to Inference
Thurs	Oct 11	Chapter 13	Video Presentations, **Quiz 4**
			Homework: C13 #27, 29, 31, 33, 35
			Fall Break
Tues	Oct 23	Chapter 14	Thinking about Inference
			Homework: C14 #23, 26, 33

Thurs	Oct 25	Chapter 16	Inference about a Population Mean, **Quiz 5** Homework: C16 #25, 27bc (use x = 1.1182, s = 0.0438), #28b (use x = 12.83, s = 4.65)
Tues	Oct 30	Chapter 17	Two-Sample Problems, Review for Test 3 Homework: C17 #20, 21 (use s = 21 and s = 33.2 respectively), #22, 25
Thurs	Nov 1		**Test 3:** Chapters 13, 14, 16, 17
Tues	Nov 6	Chapter 18	Inference about a Population Proportion Homework: C18 #20, 21b, 27, 29a, 32, 34, 36, 37
Thurs	Nov 8	Chapter 19	Comparing Two Proportions, **Quiz 6** Homework: C19 #14b, 15a, 19, 27

Question 4: What health related variables are independent of other aspects?

Tues	Nov 13	Chapter 21	Two Categorical Variables: Chi-Square Test
Thurs	Nov 15	Chapter 21	Two Categorical Variables: Chi-Square Test **Quiz 7** Homework: C21 #1ab, 2a, 4, 5, 6bc, 9, 29b **Thanksgiving Break**
Tues	Nov 27	Chapter 21	Two Categorical Variables: Chi-Square Test Homework: C21 #12, 13, 15, 16
Thurs	Nov 29	Chapter 23	One-Way Analysis of Variance, **Quiz 8** Homework: C23 #25, 26
Tues	Dec 4	Review for Test 4 and Final Exam, **Project 2**	
Thurs	Dec 6	**Test 4:** Chapters 18, 19, 21, 23	
Tues	Dec 11	**Final Exam: 6:30-9:30 PM**	