Instructor: Dr. Chris Lee Trexler 270D clee@roanoke.edu (540) 375-2347

Office Hours: I am available for office hours: Mon/Wed: 3:30 – 4:30pm Tue/Thu: 3:00-4:30pm
All office hours are by appointment. To make an appointment, please use the link:
https://drchrislee.youcanbook.me/

Course Description:
As we surf the web, are we really exercising free will? Whether it be reading, shopping, or interacting socially, we'd like to think that we are in control of our choices. The reality is that web designers and marketers use conclusions drawn from vast amounts of data to carefully craft and control our web experiences and actions. This course provides an inquiry-focused introduction to the statistical methodologies necessary to successfully explore and answer this question. Along the way students will develop an understanding of how data is collected and used in relation to virtually everything we do on the internet.

Statistics Objectives: Provides an inquiry-focused introduction to statistical methodologies. Students will gain an understanding of how decision making is accomplished using modern statistical techniques. Topics include descriptive statistics, graphical methods, estimation, elementary probability, statistical inferences, and analysis of variance; students will apply the techniques of data analysis to data sets and/or statistical studies.

Learning Outcomes:

1. Students will be able to use the methodologies of statistics to
    a. Investigate a topic of interest and make decisions based on the results.
    b. Design and carry out a simple statistical experiment.
    c. Critique news stories and journal articles that include statistical information. In the critique students will recognize variability and its consequences, identify potential sources of bias and both proper and improper cause and effect inference.
2. Students will be able to articulate the importance and limitations of using data and statistical methods in decision making.
3. Students will be able to write about course topics clearly and effectively.
4. Students will be able to interpret quantitative information related to the course topic.

Technology: For some sections of the course students will need statistical software for calculations and graphics. Excel and Minitab are provided on college lab computers. Students will also need a scientific calculator.

Required Texts and Readings:
- *Statistics in Practice.* Moore, Notz, & Fligner
- *Hooked: How to Build Habit Forming Products,* Nir Eyal.
- *A Writer's Reference (6th Ed) or equivalent*

Attendance: 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. I will assume that if you accumulate 3 unexcused absences you are not interested in completing the course and will drop you from the class with a grade of DF (dropped-failing) recorded, regardless of your current average in the course. You, your advisor, and the registrar will receive a warning email at your second unexcused absence. When absent, excused or unexcused, you are responsible for all material covered in class. Work missed due to either an unexcused or excused absence can only be made up when arrangements are made in advance of the absence.

Reading and Participation: The key to learning a topic in mathematics is participation. We will strive to have an active, rather than passive, classroom environment. The last page of the syllabus is a day-by-day outline of the sections that will be discussed in class. You are fully expected to have read the upcoming section before the class meeting! This does not mean you need to understand everything, but rather you should be familiar with the definitions and concepts from the sections; having read the section will allow you to ask better questions and follow along better in class.

Homework: Homework problems will be assigned almost every class period and are due at the start of the next class period on Mondays and Wednesdays. Each HW assignment is graded satisfactory/unsatisfactory. Your HW average is calculated at the end of the term by the percentage of assignments that are satisfactory. The following criterion must be met on an individual assignment for it to be considered satisfactory: Every problem must be attempted with work shown. At least two-thirds of the problems must be worked to completion (errors are allowed, we're learning here).

Writing: While knowing statistics is important, it is useless if you cannot communicate the ideas and concepts you have learned, and more importantly, apply them to a topic such as whether or not we have free will on the internet. There are four writing assignments throughout the semester. These are an important and significant component of the course. These assignments will push you to address issues from a statistical standpoint and improve your writing and communication skills.

> **Writing Assignment 1**: This is personal, reflective opinion writing. You will be asked to describe some of your daily activities on the internet and think through how you may be being manipulated, or if you are above manipulation and are truly doing whatever you'd like on the internet.
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> **Article Analysis**: For this assignment you will critique an article from an established news source. The topic of the article will be the use of statistics by online entities. You will use the knowledge you have gained thus far in the course to critique the methods used by the author.
>
> **Project**: Prior to the date this project is started, you will have read the entire book *Hooked: How to Build a Habit Forming Product* by Nir Eyal. You will then propose your own product that you would like to bring to market. This may be a competitor to Facebook, a photo sharing site, a new game, or any other such similar product. Your initial product design will be well thought out. Then, you will apply statistical concepts you have learned in this course. You will design and identify the importance features of statistical studies of data you will measure about users of your products. You will describe how you will apply this quantitative information to make decisions or draw conclusions about needed changes to your product to increase success. Finally, you will discuss how you will handle uncertainty in the data you propose to measure. How will uncertainty affect your analysis and continued development of your product?

Late Work: Unless specific permission is given in advance of the due date, no late work will be accepted.

Grading: Components of a student's grade will be weighted as follows:

Tests: 80% Short Writing: 5% Project: 10% Homework: 5%

A scale will for final grades will be not be lower than the scale given below.

0	*60*	*63*	*67*	*70*	*73*	*77*	*80*	*83*	*87*	*90*	*93*
F	*D-*	*D*	*D+*	*C-*	*C*	*C+*	*B-*	*B*	*B+*	*A-*	*A*

Testing: We will be making use of **mastery-based testing** rather than a points-based system. Mastery-based testing is very different from what you are used to – do not hesitate to ask me questions.

> **Description**: You only receive credit for answers that demonstrate you completely understand (have mastered) a topic. But, you get many chances to display mastery throughout the semester with no penalty whatsoever for earlier attempts.

- The course has been boiled down to 17 essential types of questions, or "topics".
- Your mastery of questions on these topics is assessed through the working of problem each Friday and during the scheduled final exam period.
- Each problem submitted is graded as either "Mastery" or "Not Mastered". A grade of Mastery indicates that you have demonstrated full understanding of the concept being tested and further work on the topic is not necessary.
- Once you have mastered a problem you need not ever attempt it again.
- There is no penalty whatsoever for multiple attempts taken to achieve mastery.
- Mastery does not mean perfect, it means you understand and can demonstrate all fundamentals of the topic and are proficient at the level desired for the course – you do not need to study the topic further.

Your overall test grade is then determined by the number of topics you have mastered.

#Mastered	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Exam Grade	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20

Notes on Master-Based Testing (in no specific order)

- Clear content objectives, students continually know exactly what they need to work on to improve.
- Credit only for eventual mastery. No partial credit. Multiple attempts with complete forgiveness.
- A points-based system sets arbitrary deadlines by which time perfection must be attained.
- Perseverance: Points – try a problem once, maybe twice, hope for the best.
  Mastery – Keep trying until you succeed (and I know you can)
- Use of feedback: Points – do I agree with the instructors grading
  Mastery – what can I do to demonstrate that I understand the concept (improvement!)
- Reduced Test Anxiety: Points – every test has the potential to damage your GPA.
  Mastery – no one test can harm your grade.
- Intelligent Test Preparation: You may choose to skip problems on a test. Better to achieve mastery on some than to demonstrate mediocrity on all.
- No longer will any of us have to wonder just what exactly a 7/10 means on a problem compared to an 8/10…
- A "broad and superficial" strategy may earn a C or D in a points-based system, in mastery you will fail.

Cell Phones: This is very simple - no cells phones are allowed to be used or even visible in our classroom. This includes before, during, and after class. If a cell phone is seen, the student may be asked to leave the classroom and the day will be counted as an unexcused absence.

Academic Integrity: Students are expected to follow the integrity policy detailed in the handbook *Academic Integrity at Roanoke College*. Additionally, if you are ever uncertain as to how the College's

policy pertains to any assignment or exam in this course, please ask me for clarification. The bottom line is that all work that a student submits for a grade must be ***solely*** the work of that student unless the instructor has given explicit permission for students to work together. You will have the opportunity on some quizzes and our main project to collaborate with another as you work in pairs. It is critical that you understand that collaboration means both parties are contributing equally and meaningfully to the assignment. Adding your name to the work of another, as well as using a divide-and-conquer approach, are both examples of seeking credit for work that is not your own.

MCSP Conversations: As you already know from spending a few years here, the MCSP Department offers a series of discussions that appeal to a broad range of interests related to these fields of study. These are known as the talks and lectures in the MCSP Conversation Series. You are invited to be involved with all of these meetings; however, participation **at least one** of these sessions is mandatory. After attending, submit a one-page paper reflecting on the discussion. This should **not** be a regurgitation of the content, but rather a personal contemplation of the experience. These reaction papers will be submitted through Inquire; your final grade will be reduced by 2% if this is not completed

The Writing Center @ Roanoke College, located on the Lower Level of Fintel Library, offers tutorials focused on writing projects and oral presentations for students working in any field. Writers and presenters at all levels of competence may visit the Writing Center at any point in their process—including brainstorming, drafting, organizing, editing, or polishing presentation skills—to talk with trained peer tutors in informal, one-on-one sessions. The Writing Center is open Sunday through Thursday from 4 to 9 pm. Simply stop in, or schedule an appointment by going to www.roanoke.edu/writingcenter, where our staff members and workshops are also posted. Questions? Email writingcenter@roanoke.edu or call 375-4949. Like our Facebook page for hours and event updates!

Subject Tutoring, located on the lower level of Fintel Library (Room 5), is open 4 p.m. – 9 p.m., Sunday – Thursday. We are a Level II Internationally Certified Training Center through the College Reading and Learning Association (CRLA). Subject Tutors are highly trained Roanoke College students who offer one-on-one tutorials in a variety of general education and major courses such as: Business, Economics, Mathematics, INQ 240, Modern Languages, Lab Sciences, INQ 250 & Social Sciences (see all available subjects at www.roanoke.edu/tutoring). Tutoring sessions are available in 15, 30, or 45-minute appointments. Feel free to drop by for a quick question or make an appointment at www.roanoke.edu/tutoring for a longer one-on-one appointment. For questions or concerns, please call 540-375-2590 or subject_tutoring@roanoke.edu.

Accessible Education Services (AES) is located in the Goode-Pasfield Center for Learning and Teaching in **Fintel Library**. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Dr. Sue Brown, Director of Academic Services and Acting Coordinator of Accessible Education Services, at 540-375-2247 or by e-mail at sbrown@roanoke.edu to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Dr. Brown at your earliest convenience to schedule an appointment.

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

Mon	Jan 15	Intro
Wed		Topic 1 – Chap 1 – Picturing Distributions with Graphs
Fri		Topic 2 – Chap 2 – Describing Distributions with Numbers
Mon	Jan 22	Topic 2 – Chap 2 – Describing Distributions with Numbers
Wed		Topic 3 – Chap 3 – The Normal Distribution
Fri		Topic 3 – Chap 3 – The Normal Distribution
Mon	Jan 29	**"Hooked" book discussion, chapters 1-2**
Wed		Topic 3 – Chap 3 – The Normal Distribution
Fri		Topic 4 – Chap 4 – Scatterplots and Correlation
Mon	Feb 5	Topic 5 – Chap 5 – Regression
Wed		Topic 6 – Chap 6 – Two-way Tables
Fri		Topic 6 – Chap 6 – Two-way Tables
Mon	Feb 12	Topic 7 – Chaps 9,10 – Producing Data
Wed		Topic 7 – Chaps 9,10 – Producing Data
Fri		Topic 8 – Chap 11 – Introduction to Probability
Mon	Feb 19	Topic 9 – Chap 12 – General Rules of Probability
Wed		Topic 9 – Chap 12 – General Rules of Probability
Fri		Topic 10 – Chap 15 – Sampling Distributions for a proportion
Mon	Feb 26	**"Hooked" book discussion, chapters 3-5**
Wed		Topic 10 – Chap 15 – Sampling Distributions for a proportion
Fri		Topic 11 – Chap 16 – Confidence Intervals
Spring Break		
Mon	Mar 12	Topic 11 – Chap 16 – Confidence Intervals
Wed		Topic 12 – Chap 17 – Tests of Significance
Fri		Topic 12 – Chap 17 – Tests of Significance
Mon	Mar 19	**Project Assignment / Group work**
Wed		Topic 13 – Chap 19 – Sampling Distribution for a Mean
Fri		Topic 13 – Chap 19 – Sampling Distribution for a Mean
Mon	Mar 26	Topic 14 – Chap 20 – Inference about a Population Mean
Wed		Topic 14 – Chap 20 – Inference about a Population Mean
Good Friday		
Mon	Apr 2	**Group work**
Wed		Topic 16 – Chap 24 – The Chi-Square Test
Fri		Work Topics

Homework

- Collected at the start of class every Monday and Wednesday

Mastery Attempts

- Every Friday throughout the term and during the final exam block.
- On any given opportunity you can work any topics which have been covered.

Mon	Apr 9	**Project presentations**
Wed		Topic 16 – Chap 24 – The Chi-Square Test
Fri		Work Topics
Mon	Apr 16	Topic 16 – Chap 24 – The Chi-Square Test
Wed		Topic 17 – Chap 26 – One-Way Analysis of Variance
Fri		Work Topics
Mon	Apr 23	**Projects Due** / Review
Wed	Apr 30	**Final Exam 2:00-5:00pm**