Statistical Concepts and Analysis (MTH107)

Dr. Derek H. Ogle Winter, 2014

Description: Introduction to the concepts and interpretation of statistics. Summary graphs and statistics; data production (sampling and experiments); random variables and sampling distributions; inference - introduction, for distributions, for proportions; correlation and regression. Prerequisite: MTH103, ACT math > 17, or SAT math > 830. 4 Credits.

Outcomes: At the end of this class you will be able to ...

1. describe why statistics is central to scientific inquiry (& your field of interest);
2. define basic statistical words and symbols;
3. perform appropriate exploratory data analyses (univariate and bivariate);
4. identify the purposes of and conducted and interpret the results of a linear regression;
5. design simple experiments and sampling strategies;
6. construct and interpret confidence intervals for one and two-sample mean and proportion problems;
7. identify the appropriate hypothesis test to perform in one- and two-sample quantitative and categorical data situations;
8. construct and interpret the results from a hypothesis test for one- and two-sample quantitative and categorical data situations; and
9. communicate statistical results and ideas in a succinct and informative manner.

We will focus on the understanding of statistical concepts and proper interpretation of statistical results.

Web Page: **droglenc.wordpress.com/** then select the "Teaching" menu and "Statistical Concepts" submenu.

Location: CSE 236 (computer lab) **Time:** MWF 10:00-11:30

Contact: CSE239; 682-1300; dogle@northland.edu **Office Hours:** MWF 900-950, or by appointment

Tutors: **Louis Corcoran** – Tues 630-830p ; Thurs 930-1130a **Young Lee** – Mon 700-900p; 900-1100a

Accommodations: Students in need of academic accommodation should contact Kathleen Skoraczewski, Campus Counselor and Disabilities Service Coordinator, ext. 1369, Ponzio Center Rm. 232, kskoraczewski@northland.edu.

Conduct: Your conduct in class should revolve around the idea of being respectful of me and others in the class. I will ask you to leave class if you behave disrespectfully. Adhering to the following policies should be considered the minimum requirements to being respectful of others:

1) Arrive to class on time. If a situation arises where you will arrive late, then take the first available seat as quietly as possible.
2) Do not bring friends, children, pets, meals, or anything else to class that should not be there.
3) **Turn off and store out-of-sight cell phones and other electronic devices (personal laptops are ok).**
4) **Do not use the college or personal computers for other than assigned tasks.**
5) Do not engage in side discussions while I or others are speaking to the entire class.
6) Do not use disrespectful language when addressing others.

Textbook: I will provide a PDF document on the webpage as the text for this course. This document cannot be printed, but I will make arrangements on the first day of class for you to a hard copy (for the cost of copying) if you are interested.

Grading: An overall percentage score will be computed from the items and associated weights below:

Daily Reading Quizzes **7%**
Homework 1**0%**
Midterm Exams (3) ..... **54%** .....*each equally weighted*
Final Exam **29%**

Lowest possible final letter grades will be assigned by comparing your overall percentage score (rounded to a whole number) to the values shown below:

		A	92-100	**A-**	90-91
B+	87-89	**B**	82-86	**B-**	80-81
C+	77-79	**C**	70-76		
D+	67-69	**D**	60-66	**F**	0-59

Quizzes: A short quiz will be given in the **FIRST** few minutes of **EVERY** class period to encourage you to complete the reading that is required for that day's class. You will be notified of the chapter, sections, or pages in the text that will be required for the period at the end of the previous class period. Missed quizzes cannot be made up.

Each individual quiz will be graded on a 3-point basis – 3 points for the correct answer, 1 point for an answer that is not completely correct but demonstrates some understanding from the reading, and 0 points for answers that show little to no understanding from the reading. I you earn at least 70% on all quizzes this semester then you will earn the full 7% towards your final grade. You will also earn one percentage point of extra credit on your final grade for every ten percentage points you earn on the quizzes over 80%. For example, if you earn a 90% quiz grade, then you will have earned the full 7% for quizzes and an additional 1% extra credit on your final grade. Alternatively, if you earned 50% on the quizzes, then you will have earned only 5% (of the 7%) for quizzes and no extra credit.

Homework: The text contains many review exercises throughout each chapter and a few homework problems at the end of each chapter. All homework problems will be completed and turned in to me at times I will announce in class. Homework problems will be graded for completeness (you will be responsible for checking content with on-line answer keys that will be provided). Review exercises can be completed with others but homework problems should be completed by you alone. If there is any indication, whether I can confirm it or not, that you have not worked alone on your homework then you will received a 0 for that homework and will be warned of further penalties for subsequent offenses.

Exams: Exams will be on **7-Feb (Fri), 3-Mar (Mon), 31-Mar (Mon)**, and **16-Apr (Wed)**. Make-up exams will be provided only if you have a fixed commitment of sufficient importance that was set before the beginning of the semester or a verifiable medical condition. You will not be allowed to make up an exam missed without my prior approval. The final exam will not be given early.

Participation: This course is taught in the framework of active-learning, peer-instruction, and inquiry-based pedagogies. As such, you will be asked to prepare for class prior to class by reading the text, asking and answering questions based on your reading, working in small groups with others in the class, and participating in small- and large-group discussions. Your participation in these activities is critical to your learning and, thus, your success in this course.

I will take attendance each day but will not factor attendance into your final grade with the exception that I may, at my discretion, use your attendance record as one piece of evidence in deciding to positively adjust your final grade.

Incomplete Grades: Under Northland College policy, an incomplete grade will be given ONLY under extreme circumstances beyond your control, such as a major illness. An incomplete grade will be given ONLY if you have successfully completed the entire course except for the final exam.

Extra Credit: There are three options to earn as much as 5% extra credit on your final grade.

Exam Reflections. – A two-part *typed* reflection on each midterm exam. The "correction" portion of the reflection should include correct answers for each question you missed along with ***an explanation of why the answer you originally provided was not correct and why the correct answer is correct.*** You will receive no credit for simply correcting your answer, for providing another incorrect answer, or saying "I have no idea why I put that answer", "I simply wrote the wrong answer", "I don't know what I was thinking", or any other non-sensical reason. You must address every question you missed to receive full credit for this portion. Your answers must be typed and easy to find (i.e., *neatly organized by question number*) and ***you must include the original exam***. This portion is worth 2/3rd of the overall value.

The "reflection" portion should include your ***thoughtful*** reflections about the exam, including what you did well on the exam (and why), what you did not do so well on the exam (and why), what strategy you used in preparing for the exam, how you will change your strategy to prepare for the next exam, and whether the exam was fair or not. This portion should be at least one page but not more than two pages and is worth 1/3rd of the overall value.

Each reflection is worth the smaller of either 1.5% or the percentage required for your exam score to equal 100% times 0.15. For example, if Jonny and Jenny each write perfect exam reflections but Jonny had a 70% on his exam and Jenny had a 92% on her exam then Jonny will earn 1.5% extra credit and Jenny will earn 8%*0.15=1.2% extra credit.

News Item Report. – A one- or two-page *typed* paper about a news item that illustrates the use of statistics in everyday life. Your report should discuss the background of the information in the report, the use of statistics, how the statistics relate to what you've learned in class, how the statistics were presented, how you feel about that presentation, and any questions that you may have. Note that the FOCUS of your report should be on the statistics used in the news item. Two of these reports may be completed, each is worth as much as 0.5%, and both are due before **Friday, 11-Apr**.

Report on the Use of Statistics in Other Classes. – A one- or two-page *typed* paper about your use of statistics in another class at Northland. Note that the simple reporting of someone else's statistics in a report does not qualify here; this extra credit item should pertain to your collection and analysis of data. Your report should discuss the background of the project where you used statistics, what the statistics were used for (i.e., purpose), a presentation of your statistical work in the report (i.e., findings), how the statistics relate to what you've learned in class, and any questions that you may have. Note that the FOCUS of your report should be on the statistics that you used. Reports that show little focus on the statistics will receive 0 credit. Two of these reports may be completed, each is worth as much as 0.5%, and both are due before **Friday, 11-Apr.**

Tentative Schedule (Subject to Change)

Date	Topic
8-Jan	Syllabus, Why Stats is important
10-Jan	IVPPSS and Variable Types; Introduce Rstudio
13-Jan	R Introduction
15-Jan	**NO CLASS**
17-Jan	R Introduction
20-Jan	Univariate EDA - Quantitative
22-Jan	Univariate EDA - Quantitative
24-Jan	Univariate EDA - Categorical
27-Jan	Normal Distributions
29-Jan	Normal Distributions
31-Jan	Bivariate EDA -- Quantitative
3-Feb	Bivariate EDA -- Quantitative & Categorical
5-Feb	**Flex Day**
7-Feb	**Exam**
10-Feb	Linear Regression
12-Feb	Linear Regression
14-Feb	Linear Regression
17-Feb	Data Production
19-Feb	Data Production; Probability
21-Feb	Sampling Distributions
24-Feb	Sampling Distributions
26-Feb	**NO CLASS**
28-Feb	**Flex Day**

Date	Topic
3-Mar	**Exam**
5-Mar	**NO CLASS**
7-Mar	**NO CLASS**
10-Mar	Inference -- Hypothesis Testing
12-Mar	Inference -- Hypothesis Testing
14-Mar	Inference -- Confidence Regions
17-Mar	Inference -- Confidence Regions
19-Mar	Inference -- 1-Sample Z-test
21-Mar	1-sample t-test
24-Mar	1-sample t-test
26-Mar	2-sample t-test
28-Mar	**Flex Day**
31-Mar	**Exam**
2-Apr	2-sample t-test
4-Apr	2-sample t-test
7-Apr	Chi-Square Test
9-Apr	Chi-Square Test
11-Apr	Goodness-of-Fit Test
14-Apr	**Flex Day**
16-Apr	**Exam**
18-Apr	**NO CLASS**