NRE 538 Natural Resource Statistics - Winter 2017

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GSI: Oscar Chang (fhchang@umich.edu)

Lecture Meeting Times: M/W 5:30-7:00 PM; 1046 Dana
Lab Meeting Times: Th 5:00-7:00 PM or F 2:00 – 4:00 PM; 3325 Dana

Office Hours: Meha Jain, W 3:30-5:30 PM; 3540 Dana
Oscar Chang, M/F 4:00-5:00 PM; 1st Floor Commons

Textbook(s):
Required: Statistics (the Easier Way) with R by Nicole M. Radziwill. Available from Amazon, Barnes and Nobles, and the Campus Bookstore. First 82 pages are available online for free (https://qualityandinnovation.files.wordpress.com/2015/04/radziwill_statisticseasierwithr_preview.pdf). The book is also on Reserve at Shapiro Library.
Optional: Statistics (any edition) by David Friedman, Robert Pisani, and Roger Purves - Amazon

Overview: The study of natural resources, natural sciences, and the environment is increasingly focused on quantitative methods to characterize systems, test hypotheses, and develop solutions to real-world problems. As such, an understanding of statistical analyses is essential to anyone working in these fields. This course covers applied introductory statistics. Since the course is applied, we will focus on when and why different statistical techniques should be used to analyze different datasets, rather than deriving the mathematical underpinnings of these techniques. Additionally, through this course, you will be introduced to one of the most common statistical programming languages: R. There are no prerequisites to take the class.

Learning Mechanisms: (1) readings, (2) lectures, (3) in class assignments, (4) weekly labs, (5) bi-weekly quizzes, (6) a final group project, and (7) a final exam. Readings will be from the required course textbook unless they are marked with an *. The additional readings, marked with an *, will be distributed through the Canvas website.

Evaluation: The final grade will be based on completion and accuracy of weekly labs (25%), online participation answering blog posts (10%), five in-class, closed book quizzes (20%), a final group project (15%), and a cumulative, in-class, partially open-book final exam (30%).

Note 1: If you need accommodations for a disability, please contact the Services for Students with Disabilities (SSD) office at 734-763-3000 or email ssdoffice@umich.edu. You are also welcome to email the instructor or drop by during office hours to discuss your academic needs. Since accommodations require early planning and are not retroactive, please contact the office as soon as possible (before January 18th as the first quiz is January 25th).

Note 2: Students are expected to take personal responsibility for understanding and observing the Rackham Academic and Professional Integrity Policy. Zero credit will be given for any assignments involving acts of dishonesty, and additional acts can result in failing the class.

Please see the following link for more details: http://www.rackham.umich.edu/current-students/policies/academic-policies/section11

Note 3: There are no make-up lab assignments, quizzes and exams, projects, and in-class activities. Late labs (even 1 minute late) = 0%. Extraordinary cases will be handled on a case-by-case basis.

Grading: Grades will be as follows:

Grade	Percentage Points
A+	97-100
A	93-96.9
A-	90-92.9
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9
D+	67-69.9
D	63-66.9
D-	60-62.9
F	Below 60

Total grades are determined based on components 1-6 detailed below:

(1) Lectures: It is STRONGLY SUGGESTED that you attend all lectures. We will be covering important material in the lectures that is not covered in the readings or the labs. The material presented in lectures will form some of the material for quizzes and the final exam. You do not need to email us if you are unable to attend a lecture for any reason, but please get good notes from another classmate to learn what you missed. Lecture slides will be posted to Canvas immediately AFTER the lecture has been presented (and will not be available beforehand).

(2) Participation (10% of total grade): We will give participation points based on answering questions on the class blog. Participation is expected throughout the entire semester (we expect that you will answer questions for at least 12 out of the 15 weeks of the semester). More details about the online blog and how to contribute to it will be disseminated soon.

(3) Lab Sections (25% of total grade): Attending your assigned lab section is MANDATORY each week. There will be 10 lab assignments throughout the semester, which are clearly marked in the detailed syllabus below – labs that are not marked with an assignment do not have anything to turn in. Lab assignments must be turned in using Canvas by 11:59 PM on the following Monday for those who attend the Thursday lab, and by 11:59 PM on the following Tuesday for those who attend the Friday lab. No late assignments will be accepted and you will automatically earn 0% for a lab if it is not turned in on time. It is therefore in your best interest to

submit an incomplete lab over a late lab because you will at least earn points for what you have finished with an incomplete lab. If you are unable to attend a lab section due to extenuating circumstances, please email the Instructor as well as the GSRA. Even if you are unable to attend the lab session, you will still be required to turn in all assignments on the typical deadline for your lab section and no extensions will be given except for extenuating circumstances that will be decided on a case-by-case basis. Please note that you may work with other students on labs, but you must complete every part of each lab and turn in a final document that you produced (and not a group document). While working together is encouraged, you cannot copy and paste another student's code and/or text – such copying will be considered against Rackham's integrity policy. Labs may require more than the two hour period to complete so any parts of the lab that are not completed by the end of the lab session must be completed at home.

(4) Quizzes (20%): We will have five, in-class, closed book quizzes throughout the semester. The date of each quiz is listed in the detailed syllabus below. These quizzes will not be cumulative, and will only cover material that was discussed immediately after the previous quiz and immediately before the current quiz. We will drop your quiz that has the lowest grade, resulting in each of the four highest-scoring quizzes counting for 5% of your total grade. There are no make up quizzes, however, if you have an extenuating case that results in you needing to miss a quiz you should email the Instructor in advance of the quiz. Doctor's notes will be required if you are too sick to take a quiz. No practice problems will be provided for preparation.

(5) Group Project (15%): In the middle of the semester you will be assigned to a four-person group to complete a group project by the end of the semester. For this project, we will provide your group with an existing dataset and will require you to conduct different statistical analyses on these data. Your group will present your results during a 10-minute presentation during one of the last two classes. Clear criteria for what is required for this project will be added to Canvas as a separate document at a later date. All group members within a project will receive the same grade, unless there are clear cases where a group member did not contribute at all to the final project.

(6) Final Exam (30%): We will have one three-hour long final exam at the end of the semester (to be scheduled at a later date). This exam will be partially closed book (and will resemble the quizzes) and will be partially open book (and will resemble the labs). Previous quizzes and labs can be used as samples for what types of questions we will ask during the final exam though you will never see the exact same question from a quiz or a lab on the final exam.

Getting Help and Asking Questions

- In this course we are trying to simulate how researchers ask and answer questions in the real world. The primary mode of asking and answering statistics and R coding questions is to use online blog sites, like stack overflow or statsexchange.com. Therefore for this class, we ask that you take the following strategy when you have a statistics or coding question related to the class. We will revisit the below strategy in the 3rd week of classes to see how well it is working, and amend this process as needed.
    - Step 1 – Google! You will be surprised by how many of your questions have already been asked and/or answered online. This is true both for conceptual questions about statistics as well as for coding questions in R.

- Step 2 – If after around 10 minutes of googling you can't figure out an answer, you should go to the class online blog. This blog will take the format of similar statistics and coding blogs online (e.g. stack overflow). Before you ask your question, search to make sure someone has not already asked and answered your question. If your question has not already been asked, please post your question on the blog. Other students may answer your question, and these answers will be counted towards their participation points. The Instructor and GSRA will also check this blog periodically (1-2 times per week) to ensure that questions are being answered accurately and to identify any common themes of questions that we will address in class and/or lab section. The intention of the blog is not for the instructors to answer questions, but it is for the students to collaboratively help one another, which is the same way the real-world statistics community works. The instructor and GSRA will not reply to statistics questions that are emailed to us, so please post all questions you have to the blog.
- Step 3 –If you feel that you have a question that has not been addressed by your peers on the blog, you may also stop by the Instructor or GSRA's office hours to ask any questions related to the course or to address any concerns. We are only available during posted office hours, and these office hours are not for us to provide guidance for non course-related statistics questions that may be related to your research outside of this class. For general statistics questions that are not related to this course, please contact Shikha Marwah (marwahs@umich.edu), the research statistics advisor for SNRE.
- Step 4 – We will address common problems and questions that we see from quizzes and the blog in review sessions during some class and lab periods (as shown in the detailed syllabus below).

Detailed Syllabus and Reading List (tentative and subject to change). Readings from 1/18 onwards will be updated soon.

Week	Date	Topic	Lab	Readings
Week 1	Wed 1/4	Why do we care about statistics?	Intro to R/SwirlR	i-x; 3 – 8, 12-16
Week 2	Mon 1/9	Data and Descriptive Statistics	Basic R commands and data visualization. Assignment 1	24-31 (up to Bessel's correction), 34-39, 41-46, 84-90, 91-96 (up to Supplemental R code), 105-111, 113-117
	Wed 1/11	Sampling and Bias		162-172
Week 3	Mon 1/16	Martin Luther King Day – no class		
	Wed 1/18	Confidence Intervals, Central Limit Theorem;	Sampling, Confidence Intervals, Central Limit Theorem. Assignment 2	

Week 4	Mon 1/23	Quiz 1; Hypothesis Testing	T-test, Non-parametric tests. Assignment 3.	
	Wed 1/25	T-tests		
Week 5	Mon 1/30	ANOVA	ANOVA, Non-parametric tests. Assignment 4.	
	Wed 2/1	Non-parametric tests;		
Week 6	Mon 2/6	Review 1	Data Cleaning in R. Review session.	
	Wed 2/8	Quiz 2; Experimental Design		
Week 7	Mon 2/13	Correlation + R^2	Linear Regression Part 1. Assignment 5.	
	Wed 2/15	The importance of linear models		
Week 8	Mon 2/20	Fundamentals of linear regression	Linear Regression Part 2. Assignment 6.	
	Wed 2/22	Quiz 3; Power and Sample Size		
Spring Break!	Mon 2/27	No class		
	Wed 3/1			
Week 9	Mon 3/6	Multiple Linear Regression	Multiple Linear Regression. Assignment 7.	
	Wed 3/8	Multicollinearity, bias variance tradeoff		
Week 10	Mon 3/13	Variable selection, interaction terms	ANCOVA + Interaction terms. Assignment 8.	
	Wed 3/15	ANCOVA; Review 2		
Week 11	Mon 3/20	Quiz 4; Group Projects	Group Project Questions/Review session.	
	Wed 3/22	Fixed vs Random Variables		
Week 12	Mon 3/27	Intro to GLM	GLM + Logistic regression. Assignment 9.	
	Wed 3/29	Intro to Resampling		
Week 13	Mon 4/3	Intro Repeat Data	Resampling. Assignment 10.	
	Wed 4/5	Quiz 5; Group Projects		
Week 14	Mon 4/10	Student Presentations	Review Session	
	Wed 4/12	Student Presentations		
Week 15	Mon 4/17	Overall Class Review	No Lab	