STAT 2480 Lecture: Statistics for the Life Sciences

Instructor: Dr. Xinyi Xu / Dr. Yunzhang Zhu
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Lecture Location: Hagerty Hall 180
Lecture Time: WF 1:50-2:45PM

GE category: Data Analysis.

GE expected learning outcomes: Students understand basic concepts of statistics and probability, comprehend methods needed to analyze and critically evaluate statistical arguments, and recognize the importance of statistical ideas.

Required text: The Analysis of Biological Data, 2nd Ed by M.C. Whitlock and D. Schluter, Roberts & Co., 2014.

Course description: Statistical methods play an important role in the analysis of data collected in the biological sciences. This course will provide an introduction to the analysis of biological data in a statistical framework. The topics covered include the definition of probability and manipulation of probabilistic quantities; the common discrete and continuous distributions used in modeling biological phenomena; experimental design; statistical methods for testing hypotheses.

Upon completion of this course you should be able to: (1) display and describe biological data, (2) compute probabilities associated with outcomes of random phenomena, (3) understand the use of sampling distributions as the foundation of inference, and (4) analyze data through confidence intervals, hypothesis testing, and linear regression.

Course website: Many course materials will be available on Canvas. Please check it periodically for announcements for the class and other class material.

Recitations and MSLC: Please sign up for the lab/recitation sessions. The TAs will help you review important concepts and do practice problems in these sessions. Also, free tutoring with course materials can be obtained in the Mathematics and Statistics Learning Center (MSLC). More information will be posted on Canvas.

Statistical computing: You will be required to do some basic statistical analyses on the computer using the statistical software package R for your assignments. This software is installed in the recitation classrooms, as well as in most computer labs on campus. It is free software that you can download and install on your personal machines as well. More information on R will be given on the course website. Your TAs will help you learn to use R for statistical analysis during recitation, but you should also expect to put in time outside of recitation doing data analysis with R for homework.

E-mail correspondence: In order to protect your privacy, all course e-mail correspondence must be done through a valid OSU name.nn account.

Grading:

Homework	30%
Lab participation	10%
Quizzes	20%
Midterm	20%
Final	20%

The following rubric will be used for determining final grades: A = 93-100, 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 = 60-66.9, E = below 60

Homework: Homework problems will be assigned approximately every other week. Homework must be turned in during recitation on the date it is due. **NO LATE HOMEWORK WILL BE ACCEPTED.** Please write your name on the top of each page of your assignment and staple the pages together. Each homework assignment will also include exercises that are "recommended", but not turned in. These are fair game in terms of concepts for exams.

Quizzes: Quizzes will be given during the recitations on each topic covered in the course. They will be similar to the homework problems, but will be close-book/close-notes.

Exams: There will be one midterm and one final exam.
>   Midterm (tentative):   October 7, Friday, in class
>   Final: December 14, Wednesday, 12-1:45pm

- Both exams will be in-class, close-book/close-notes. Statistical tables will be provided as needed. Calculators may be used on the exams, but the calculators on cell phones, PDAs, or any other communication device are NOT allowed. You may use one 8.5 x 11 inch sheet of paper (both sides, handwritten), with whatever facts, formulas, or explanations you find helpful.

- There will be NO makeup exams. The only excuses for missing an exam are a serious illness requiring hospitalization or a major family crisis. Proof must be provided in the form of an official document. A note from a family member alone is not sufficient.

- You have until one week after receiving your grades on the exams to dispute the grade; the same applies to any homework grade. Note that when asking for a question to be re-graded, the entire assignment/exam may be re-graded, and so you run the risk of losing more points than you gain back.

Important note: To receive full credit on homework, quizzes and exams, you need to show your justifications for all work. Answers without work will receive only partial credit.

Academic misconduct: Although students are encouraged to work together on homework assignments, each student must submit their own written work in his or her own words. Academic misconduct will not be tolerated and will be dealt with procedurally in accordance with University Rule (http://oaa.osu.edu/procedures).

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Special accommodations: Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/.

Note: Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advanced notice.

Tentative Lecture Schedule

Date	Lecture Topic	Textbook Reading
8/24	Introduction/Displaying Data	Ch. 1 &2
8/26	Descriptive Statistics	Ch. 3
8/31	Probability	5.1-5.7
9/2	Probability	5.1-5.7
9/7	Bayes Theorem	5.7-5.9
9/9	Probability Distributions	5.4
9/14	Binomial Distribution	7.1-7.4
9/16	Testing a Proportion	7.1-7.4
9/21	Discrete Data, χ^2 Test	8.1-8.5
9/23	Poisson Distribution	8.6
9/28	Odds Ratios	9.1-9.2
9/30	Contingency Tables	9.3-9.4
10/5	Review for Midterm	
10/7	Midterm	
10/12	Wrap up for the 1st half. Introduction to the 2nd half	
10/19	Normal Distribution	10.1-10.5
10/21	Sampling Distributions	10.6
10/26	Estimating Means, Confidence Intervals	11.1-11.2
10/28	Hypothesis Test for Single Mean	11.3-11.4
11/2	Hypothesis Test for Single Variance	11.5
11/4	Comparing Two Means	12.1-12.3
11/9	Hypothesis Testing/Comparing Two Variances	12.4-12.7
11/16	Experimental Design	Ch. 14
11/18	Correlation and Regression	Ch. 16
11/30	Linear Regression	17.1-17.3
12/2	Linear Regression	Ch. 17
12/7	Course Summary/Review for Final Exam	

Tentative Recitation Schedule

Date	Recitation Topic	Date	Recitation Topic
8/25	Lab 1: Intro to R	9/1	Lab 1 Continued: Intro to R/HW 1 Due
9/8	Lab 2: Random Sampling / Quiz 1	9/15	Lab 3: Displaying Data with R/HW 2 Due
9/22	Lab 4: Binomial Distribution /Quiz 2	9/29	Lab 5: Categorical Data /HW 3 Due
10/6	Lab 6: Problem Solving /Quiz 3	10/20	Lab 7: Normal Distribution Plots/HW 4 Due
10/27	Lab 8: Central Limit Theorem /Quiz 4	11/3	Lab 9: Confidence Intervals /HW 5 Due
11/10	Lab 10: Hypothesis Testing /Quiz 5	11/17	Lab 11: Regression / HW 6 Due
12/1	Lab 12: Problem Solving /Quiz 6		