Statistics for Biology

Spring 2015 Section 04



Instructor: Kelly Findley Class time: MW 6:45-8pm Lecture Classroom: OSB 108 Office: Bio Unit 308 (map on bb) Credit Hours: 4 Email: <u>k.findley@stat.fsu.edu</u> Recitation: F 11:15-12:05pm Recitation Classroom: OSB 110 Office Hours: Mon. 11:15-12:15pm, Thurs. 3:30-4:30pm

Syllabus Change Policy

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

Liberal Studies for the 21st Century: Quantitative and Logical Claims

The Liberal Studies for the 21st foundation that will enable FSU graduates to thrive both intellectually and materially and to support themselves, their families, and their communities through a broad and critical engagement with the world in which they live and work. Liberal Studies offers a transformative experience; this course has been approved as meeting the Liberal Studies requirements and thus is designed to help you become a critical analyzer of quantitative and logical claims.

In order to fulfill the State of Florida's College mathematics and computation requirement the student must earn a "C" or better in the course.

Course Information

- **Class Notes:** We will be using fill-in-the-blank class notes for lectures. You can find the notes on blackboard. Please print off the appropriate notes to get the most out of class lecture.
- **Textbook**: (Recommended) Samuels, Myra L., Jeffrey A. Witmer, and Andrew Schaffner, Statistics for the Life Sciences, 4th Edition, 2011, ISBN-10: 0321652800,ISBN-13: 978-0321652805
- TI-83/84 Calculator (or other calculator with statistical functions) (Required): Learning to use a calculator to complete basic statistical functions will fulfill the Liberal Studies Technology Requirement. Please bring your calculator to every class. Cell phones are not an acceptable calculator for quizzes or exams.
- **Blackboard**: Please check the blackboard site regularly for announcements, homework, notes, and current grades. Note it is *your responsibility* to ensure that your grades are inputted correctly into blackboard. Please notify me within 2 weeks of missing or incorrect grades from the date the quiz or exam was turned in.

Course Description

Prerequisite: MAC 2311 and biology major status or departmental approval. Special Note: Only two semester hours of credit are given for STA 2171 if "C-" or better has been previously earned in STA 2023. No credit is given for STA 2171 if a "C-" or better has been previously earned in STA 2122 or STA 3032 or QMB 3200.

This course provides an introduction to statistics emphasizing applications in Biology. Topics include descriptive statistics, elementary probability, the binomial and normal distributions, confidence intervals and hypothesis tests for means and proportions, correlation and regression, contingency tables and goodness-of-fit tests, analysis of variance and non-parametric tests.

The purpose of this course is to prepare students for further study and job preparation in the field of Biological Sciences including Medicine, Dentistry, other healthcare professions, Veterinary Medicine, Zoology and Botany. It will emphasize understanding of data and interpretation of statistical analyses. It will require students to think of data, and report the results of their analyses, in context.

Course Objectives

By the end of the course, students will demonstrate the ability to:

(1) Analyze and address problems drawn from real world scenarios by applying appropriate mathematical, statistical, logical, and/or computational models or principles.

(2) Interpret and evaluate data and information as presented in a variety of modes (such as tables, graphs, and charts), using appropriate technology. They will also be able to clearly communicate a summary of their findings to peers.

The above two competencies will be assessed in the L.S. Quantitative Assessment for STA 2171, which includes a written summary of results.

- (3) Use descriptive statistics and graphical methods to summarize data accurately.
- (4) Use inferential statistics to make valid judgments based on the data available.
- (5) Select the appropriate statistical tools to analyze a particular problem.
- (6) Describe the goals of various statistical methodologies conceptually.

(7) Develop a healthy skepticism toward statistical studies and their results based on a sensible consideration of the techniques employed.

Grading

Grading Scale

A = $460 + \text{ or } 92 + \%$	B = 410-434 or 82-86.9%	C = 360-384 or 72-76.9%	D = 310-334 or 62-66.9%
A- = 450-459 or 90-91.9%	B- = 400-409 or 80-81.9%	C- = 350-359 or 70-71.9%	D- = 300-309 60-61.9%
B+ = 435-449 or 87-89.9%	C+ = 385-399 or 77-79.9%	D+ = 335-349 or 67-69.9%	F = <300 or <60%

Grading Components

You can think of your grade either on a points system or as a percentage. The class will be taken out of 500 pts. Therefore, a 100% in the class corresponds to earning 500 points.

- **Quizzes (30%):** There will be 7 quizzes during the semester. Each quiz will be worth 25 pts. (5% of your total grade). Students *may not* work together on quizzes, but students are permitted to bring in one 3x5 note card (both sides). **Students may DROP their lowest quiz grade (only 6 will count)**
- **Homework: (10%):** In addition to problems we work through in the notes, students need to complete the HW questionnaire in blackboard. There are unlimited attempts and students are encouraged to work together. Each HW questionnaire is worth 5pts (HW5 is worth 10pts).
- **Group Activities (6%):** We will have 6, in-class group activities during the semester, each worth 5pts. Each student who comes to class and signs the roster for that day will receive full credit.
- **Attendance (5%):** Students earn 5pts for each time they are present for an Attendance Check. Students need to be present for 5 attendance checks to receive full credit; however, there will be more than 5 checks during the semester, so it is possible for students to earn Extra Credit. Students who walk in after attendance has been taken will receive half or no credit (see Attendance section).
- **Midterm Exam (20%):** There will be a Midterm Exam given on Wednesday, March 4th. It will be worth 100 pts. (20% of your total grade). Students may bring in FOUR 3x5 notecards
- **Liberal Studies Assessment (4%):** Will be conducted on Friday March 20th and is worth 20pts. The Assessment will cover Paired Data: ability to carry out a Paired t-test simply from a set of raw data and make appropriate conclusions based on the result of the test. It's basically like a Quiz over Notes 8, except it is written by the department and will cover a very focused portion of material. Students MAY NOT bring in a notecard for this. You will need to write answers in your own words.
- Projects (25%): Through the course of the semester, you will complete several "mini group projects" with the aid of the instructor and an Academic Engagement Associate (AEA). There can be no more than 3 students per group (students may work by themselves if they wish). Groups will stay intact through the entire semester and will be finalized in class on Friday, January 23rd.
 - Throughout the semester, students will be presented with datasets and research questions for each of the basic tests we learn in this class. Students will learn to use Microsoft Excel to complete the projects
 - There will be a 5 datasets total for groups to work with. Four of the datasets will require students to implement one of the following tests for each: a Two-Sample hypothesis test, a Two-Way ANOVA, a Chi-Square Contingency Table test, and a Multiple Regression test. The fifth dataset will be a "mystery" dataset which will require students to decide on their own which test would be most appropriate.
 - For each dataset given, groups will create some basic charts/graphs, create a table of summary statistics, carry out the necessary statistical tests, and state conclusions. Groups will compile all of their work into a portfolio to be turned in at the end of the semester. I would encourage you to complete each step as we proceed through the semester instead of waiting till the end to do all of it. It will be easier that way!

Grading components are broken down in the following chart

Quiz 1	25 pts	5% of total grade	
Quiz 2	25 pts	5%	
Quiz 3	25 pts	5%	
Quiz 4	25 pts	5%	
Quiz 5*	25 pts	5%	
Quiz 6	25 pts	5%	
Quiz 7*	25 pts	(replacement grade)*	
Liberal Studies Assessment	20 pts	4%	
Homework 1	5 pts	1%	
Homework 2	5 pts	1%	
Homework 3	5 pts	1%	
Homework 4	5 pts	1%	
Homework 5	10 pts	2%	
Homework 6	5 pts	1%	
Homework 7	5 pts	1%	
Homework 8	5 pts	1%	
Homework 9	5 pts	1%	
Activity 1	5 pts	1%	
Activity 2	5 pts	1%	
Activity 3	5 pts	1%	
Activity 4	5 pts	1%	
Activity 5	5 pts	1%	
Activity 6	5 pts	1%	
Attendance	25 pts	5%	
Midterm	100 pts	20%	
Project	125pts	25%	
Extra Credit	???	???	
TOTAL	500 pts	100%	

• There are 7 quizzes, but only the highest 6 scores are counted for a grade.

Attendance Policy and Make-ups

First day attendance policy and Attendance Expectations

"The University requires attendance on the first day of class. Being absent on the first day without first alerting me as the instructor will result in your being dropped from the class."

Missed Attendance Checks:

I will make announcements on bb whenever attendance is taken, and students will have **1 week** to email/show me a documented excuse if they were absent. Excused absences include **documented** illness, deaths in the family, documented crises, jury duty, religious holy days, and official University activities. Other situations will be considered on a case-by-case basis.

Missed Group Activities:

Students who miss in-class activities have **1 week** to show documentation for an excused absence for that day. Students who do so will receive credit for the activity. Students without a documented excuse will not be able to make up or receive credit for missed activities.

Late Homework

Homework cannot be completed late except with special permission by the instructor

Missed quizzes:

With Documentation or Valid Extenuating Circumstances: Preferably notify me before the quiz is given in class, but no more than **1 week after** the quiz takes place. A make-up time will be set up with an opportunity to receive full credit.

Without Documentation: Must NOTIFY me BEFORE to have an opportunity to take it for full credit, AND make-ups must generally be COMPLETED BEFORE the quiz is given in class. Accommodating make-ups after the quiz is given in class is up to the instructor and depends on the circumstance. Late notifications of missing quizzes will most likely result in make-ups for partial credit at best.

Missed Midterm exam:

Students should alert the instructor as soon as they are aware of a conflict with the exam date. A make-up time for the exam will be scheduled at a convenient time for the student. A missed exam without a valid excuse must be made up quickly and will most likely be for less credit.

Classroom Policies and Expectations

As was stated in the attendance policy section, it is important to come to class and to arrive on time. Attendance checks will generally be taken in the first 5 minutes of class. All of the necessary material for quizzes and midterm will be touched on in lecture, and students are expected and strongly encouraged to use the notes provided on blackboard during lecture.

Purposeful disruptions in class, such as having audible conversations with friends, distracting or disruptive actions, obvious and continual use of cell phone (i.e. texting with phone well in view for much of the class period), rude or disrespectful behavior, etc. may result in being asked to leave class or losing credit for a future or previous attendance check. Students who make a pattern of coming to class late may also lose attendance credit.

Academic Honor Policy

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to "... be honest and truthful and ... [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at http://dof.fsu.edu/honorpolicy.htm)

Students with Disabilities

Students with disabilities needing academic accommodation should: (1) Register with and provide documentation to the Student Disability Resource Center; and (2) Bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class. For more information about services available to FSU students with disabilities, contact the:

Student Disability Resource Center 97 Woodward Avenue, South 108 Student Services Building Florida State University Tallahassee, FL 32306-4167 (850) 644-9566(voice) (850) 644-8504 (TDD) sdrc@admin.fsu.edu http://www.disabilitycenter.fsu.edu/

Pacing Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
Jan.	5	6	7 Syllabus/Charts & Graphs		9 Sampling
	Descriptive Statistics	13	¹⁴ Group Activity 1		16 Quiz 1 (HW1 Due)
	¹⁹ MLK Day (no class)	20	²¹ Probability Part 1	22	Projects (Finalizing Groups/ Intro to Excel)
	Probability Part 2/Binomial	27	Normal Distributions Part 1	29	³⁰ Quiz 2 (HW2 Due)
	² Normal Distributions Part 2	3	4 Sampling Distributions	5	⁶ Group Activity 2
Feb.	9 Quiz 3 (HW3 Due)	10	¹¹ Confidence Intervals (One-Sample)	12	¹³ Group Activity 3
	Confidence Intervals (Proportions)	17	¹⁸ Projects (Descriptive Stats, Charts, Conf. Interval)	19	20 Quiz 4 (HW4 Due)
	²³ Hypothesis Testing (Introduction/Two Sample tests)	24	²⁵ Hypothesis Testing (One-sided Testing) (and Excel for HT)	26	Group Activity 4
	² Midterm Review	3	4 Midterm (HW5 Due)	5	⁶ Project Work Day (optional)
Mar.	⁹ Spring Break	10	¹¹ Spring Break	12	¹³ Spring Break
	¹⁶ Paired Data and Paired t-test	17	¹⁸ Wilcoxon-Signed Rank Test	19	²⁰ Liberal Studies Assessment (HW6 Due)
	²³ One-Way ANOVA	24	²⁵ F-test/Two-Way ANOVA	26	²⁷ Group Activity 5
	30 Quiz 5 (HW7 Due)	31	1 Chi-Square Goodness of Fit Test	2	³ Projects (Using Excel for ANOVA)
	⁶ Chi-Square Contingency Table Test (and Excel for Chi-Square Test)	7	⁸ Group Activity 6	9	10 Quiz 6 (HW8 Due)
April.	Linear Regression	14	Regression Inference (and using Excel for Linear Regression)	16	17 Multiple Regression
	20 Quiz 7 (HW9 Due)	21	22 Project Portfolio Workday (Last day to ask Qs)	23	²⁴ No class
	27	28	²⁹ Portfolios Due at NOON (Hard Copy in my box 2 nd floor OSB)	30	1