



USC

QBio 305 Statistics for Biological Sciences

Units: 4
Spring 2024

Lecture: Tuesdays and Thursdays, 11:00 – 12:20pm
Location: DMC 100

Discussion: Mondays 1:00 – 1:50pm or
Wednesdays 2:00 – 2:50pm
Location: RRI 421 (Mondays) or RRI 301 (Wednesdays)

Instructor: Liang Chen
Office: RRI 416E
Office Hours: Tuesdays 12:30-1:30 pm or by appointment
(Zoom or in-person)
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Teaching Assistant: Qingyang Yin
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Office Hours: Wednesdays 3:00-4:00 pm or by
appointment (Zoom or in-person)
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Course Description

Statistics for Biological Sciences is an introductory course in statistics addressed to students in the life sciences. The course uses real data from life sciences. Understanding statistics is essential for studying modern biology.

Learning Objectives

The learning objective is to illustrate statistical reasoning in biological science and medicine. The students will learn probability models, experimental design, statistical analyses, and interpretation of results. In addition, students will be introduced to R (a free computer program for statistical computing and graphics)

Prerequisite(s): none

Co-Requisite(s): none

Concurrent Enrollment: none

Recommended Preparation: none

Course Notes

This course can be taken either for a letter grade or for credit/no credit. Homework assignments and lecture slides will be posted on Blackboard.

Technological Proficiency and Hardware/Software Required

Students will be introduced to R (a free computer program for statistical computing and graphics), so students will need a computer. In addition, students will need a calculator (any type).

Required Readings and Supplementary Materials

Statistics for the Life Sciences by M.L. Samuels, J.A. Witmer and A. Schaffner. Prentice Hall, 5th Edition. This textbook can be purchased at the campus store.

Description and Assessment of Assignments

There will be weekly homework from the textbook, four R exercise problems, two R projects, two midterm exams, and one final exam.

Grading Breakdown

Assessment Tool (assignments)	Points	% of Grade
Homework (lowest one dropped)		25
R exercises		10
R projects		10
Midterm Exam 1		15
Midterm Exam 2		15
Final Exam		25
TOTAL		100

Assignment Submission Policy

Homework will be due on the following Tuesdays. R assignments and Exams will be due on the scheduled days.

Grading Timeline

Homework, R exercises, R projects, and exams will be graded within one week of submission. Grades will be entered on Blackboard.

Additional Policies

You can work together on the HW and the R assignments. However, the final work must be done by yourself. Every student must submit their own assignment.

You **cannot** work together on the exams. A 50% grade deduction will be imposed for late homework/R assignments. And no homework/R assignments later than one week will be accepted. All examinations will occur as scheduled: there will be no make-up examinations. Note particularly that university regulations strictly regulate the final examination date.

The professor reserves the right to make changes to the syllabus; these changes will be announced as early as possible so that students can adjust their schedules.

Free R-program

The course will use R, a free statistical package, for some of the projects. You can download the R-program at <https://cran.r-project.org/>. Rstudio <https://rstudio.com/>

Course Schedule: A Weekly Breakdown

	Date	Topics and Readings	Deliverables
Wk. 1	1/09/24	Introduction. Chapter 1, 1-26	
	1/11/24	Description of Samples and Populations. Chapter 2, 27-59 Note: No Discussion for Week 1	Hw
Wk. 2	1/16/24	Description of Samples and Populations. Chapter 2, 59-82	Hw
	1/18/24	R programming	
Wk. 3	1/23/24	Probability and the Binomial Distribution. Chapter 3, 83-93 <u>R-exercise 1 due</u>	Hw
	1/25/24	Probability and the Binomial Distribution. Chapter 3, 94-102	Hw
Wk. 4	1/30/24	Probability and the Binomial Distribution. Chapter 3, 102-115	Hw
	2/01/24	The Normal Distribution. Chapter 4, 122-133	Hw
Wk. 5	2/06/24	The Normal Distribution. Chapter 4, 133-140 Sampling Distribution. Chapter 5, 146-169 <u>R-exercise 2 due</u>	Hw
	2/08/24	Confidence Intervals. Chapter 6, 171-193	Hw
Wk. 6	2/13/24	R programming	
	2/15/24	Confidence Intervals. Chapter 6, 193-208, 211-222 Poisson distribution (not in textbook)	Hw
Wk. 7	2/20/24	First Midterm	
	2/22/24	Comparing of Two Independent Samples. Chapter 7, 223-248	Hw
Wk. 8	2/27/24	Comparing of Two Independent Samples. Chapter 7, 249-275 <u>R-exercise 3 due</u>	Hw
	2/29/24	The Wilcoxon-Mann-Whiney test, Chapter 7, 281-306	Hw
Wk. 9	3/05/24	Paired sample t-test and confidence interval, Chapter 8, 307-318	Hw
	3/07/24	Paired sample non-parametric tests, Chapter 8, 325-337	Hw
Wk. 10	3/12/24	SPRING BREAK	
	3/14/24	SPRING BREAK	
Wk. 11	3/19/24	Interpretation, Chapter 8, 336-340 Categorical data, estimation of proportion, Chapter 9, 355-365 <u>R-exercise 4 due</u>	Hw
	3/21/24	Categorical data, goodness-of-fit, Chapter 9, 368-382	Hw

Wk. 12	3/26/24	Categorical data, relationships, Chapter 10, 383-401, 407-412	Hw
	3/28/24	Many Samples, ANOVA, Chapter 11, 442-454	Hw
Wk. 13	4/02/24	Many samples, one and two-way ANOVA, Chapter 11, 455-465, 478-487	Hw
	4/04/24	<u>R-project 1 due</u> Second Midterm	
Wk. 14	4/09/24	Regression, correlation, Chapter 12, 511-524	Hw
	4/11/24	Regression, linear model, Chapter 12, 525-536	Hw
Wk. 15	4/16/24	Regression, linear model guidelines, Chapter 12, 537-560	Hw
	4/18/24	Additional topics in ANOVA, regression and R (not in the textbook)	
Wk. 16	4/23/24	Model selection and multiple regression (not in the textbook)	
	4/25/24	<u>R-project 2 due</u> Class Review	
	5/07/24	Final Exam 11am-1pm	

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call

studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298

equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298

usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.