



**USC**

**BISC 305 Statistics for Biological Sciences**

**Units: 4**

**Spring 2022**

**Lecture:** Tuesdays and Thursdays, 11:00 – 12:20pm

**Location:** ZHS 252

**Discussion:** Mondays 1:00 – 1:50pm or

Wednesdays 1:00 – 1:50pm

**Location:** RRI 321

**Instructor:** Liang Chen

**Office:** RRI 416E

**Office Hours:** TTh 12:30-1:30pm or by appointment (Zoom or in-person)

**Contact Info:** [liang.chen@usc.edu](mailto:liang.chen@usc.edu) 213-740-2143

**Teaching Assistant:** TBD

**Office:**

**Office Hours:**

**Contact Info:**

**Students are expected to comply with all aspects of USC's COVID-19 policy. Failure to do so may result in removal from the class and referral to SJACs. Do not come to class if you are sick: notify me as soon as possible and we will make accommodations.**

### **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, quizzes most weeks, two R projects, two midterm exams, and one final exam.

## Grading Breakdown

Assessment Tool (assignments)	Points	% of Grade
Homework (lowest one dropped)		20
Quizzes (lowest one dropped)		15
R project 1		5
R project 2		5
Midterm Exam 1		15
Midterm Exam 2		15
Final Exam		25
<b>TOTAL</b>		100

### Assignment Submission Policy

Homework will be due on Tuesdays. Quizzes will be on most Thursdays. R Projects and Exams will be due on the scheduled days.

### Grading Timeline

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

### Additional Policies

For homework assignments and projects, you can work together. However, the final work must be done by yourself. Every student must submit their own assignment.

All the quizzes and exams will be on the honor system. You can use textbooks, lecture notes, and calculators. **However, you are not allowed to seek help from others.** The submitted work must be done by yourself. If there are some evidences of violating USC scientific integrity rules, both the help provider and the recipient will receive zero credits for the relevant quizzes and exams.

A 50% grade deduction will be imposed for late homework, and no homework 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/>

### Sharing of course materials outside of the learning environment is prohibited

USC has a policy that prohibits sharing of any synchronous and asynchronous course content outside of the learning environment.

*SCampus Section 11.12(B)*

*Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the Internet or via any other media. (See Section C.1 Class Notes Policy).*

## Course Schedule: A Weekly Breakdown

	Date	Topics and Readings	Deliverables
Wk. 1	1/11/21	Introduction. Chapter 1, 1-26	
	1/13/21	Description of Samples and Populations. Chapter 2, 27-59	hw
Wk. 2	1/18/21	Description of Samples and Populations. Chapter 2, 59-82	hw
	1/20/21	Probability and the Binomial Distribution. Chapter 3, 83-93	hw, quiz 1
Wk. 3	1/25/21	Probability and the Binomial Distribution. Chapter 3, 94-102	hw
	1/27/21	Lecture on R	
Wk. 4	2/01/21	Probability and the Binomial Distribution. Chapter 3, 102-115	hw
	2/03/21	The Normal Distribution. Chapter 4, 122-133	hw, quiz 2
Wk. 5	2/08/21	The Normal Distribution. Chapter 4, 133-140 Sampling Distribution. Chapter 5, 146-169	hw
	2/10/21	Confidence Intervals. Chapter 6, 171-193	hw, quiz 3
Wk. 6	2/15/21	Confidence Intervals. Chapter 6, 193-208, 211-222 Poisson distribution (not in textbook)	hw
	2/17/21	<b>First Midterm</b>	
Wk. 7	2/22/21	Comparing of Two Independent Samples. Chapter 7, 223-248	hw
	2/24/21	R programming	
Wk. 8	3/01/21	Comparing of Two Independent Samples. Chapter 7, 249-275	hw
	3/03/21	The Wilcoxon-Mann-Whiney test, Chapter 7, 281-306	hw, quiz 4
Wk. 9	3/08/21	Paired sample t-test and confidence interval, Chapter 8, 307-318	hw
	3/10/21	Paired sample non-parametric tests, Chapter 8, 325-337	hw, quiz 5
Wk. 10	3/15/21	<b>SPRING BREAK</b>	
	3/17/21	<b>SPRING BREAK</b>	
Wk. 11	3/22/21	Interpretation, Chapter 8, 336-340 Categorical data, estimation of proportion, Chapter 9, 355-365	hw
	3/24/21	Categorical data, goodness-of-fit, Chapter 9, 368-382	R-project 1 due
Wk. 12	3/29/21	Categorical data, relationships, Chapter 10, 383-401, 407-412	hw
	3/31/21	Many Samples, ANOVA, Chapter 11, 442-454	hw, quiz 6

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Wk. 13	4/05/21	Many samples, one and two-way ANOVA, Chapter 11, 455-465, 478-487	hw
	4/07/21	<b>Second Midterm</b>	
Wk. 14	4/12/21	Regression, correlation, Chapter 12, 511-524	hw
	4/14/21	Regression, linear model, Chapter 12, 525-536	hw
Wk. 15	4/19/21	Regression, linear model guidelines, Chapter 12, 537-560	hw
	4/21/21	Additional topics in ANOVA, regression and R (not in the textbook)	quiz 7
Wk. 16	4/26/21	Model selection and multiple regression (not in the textbook)	
	4/28/21	Class Review	R-project 2 due

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## 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](http://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](http://policy.usc.edu/scientific-misconduct).

### **Support Systems:**

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

[studenthealth.usc.edu/counseling](http://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](http://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](http://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](http://equity.usc.edu), [titleix.usc.edu](http://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](http://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](http://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](http://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](http://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](http://dps.usc.edu), [emergency.usc.edu](http://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](http://dps.usc.edu)

Non-emergency assistance or information.

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

[ombuds.usc.edu](http://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.