



## QBIO 305 Statistics for Biological Sciences

**Units: 4**

**Fall 2023 Semester**

**Lecture:** Mondays & Wednesdays 14:00-15:20; SOS B46

**Discussion:** Tuesdays 9:00-9:50 RRI 421

Tuesdays 10:00-10:50 RRI 421

Thursdays 13:00-13:50 RRI 301

Thursdays 14:00-14:50 RRI 301

**Instructor: Dr. Matt Pennell**

**Office:** RRI 416J

**Office Hours:** Thursdays 12:30-13:20

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**Teaching Assistant:** Jiawei Huang

**Office Hours:** Thursdays 4-5 RRI 416L

**Contact Info:** jiaweih@usc.edu

**Teaching Assistant:** Rachel Wang

**Office Hours:** Wednesdays 2:25 RRI 416K

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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 Enrolment:** None

**Recommended Preparation:** None

**Course Notes**

This course can be taken either for a letter grade or for credit/no credit. 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. Most weeks there will also be an R assignment. In addition, there will be two midterm exams and one final exam.

## Grading Breakdown

| Assessment Tool (assignments) | % of Grade |
|-------------------------------|------------|
| Homework assignments          | 15         |
| R assignments                 | 10         |
| Midterm 1                     | 20         |
| Midterm 2                     | 20         |
| Final                         | 35         |
| <b>TOTAL</b>                  | <b>100</b> |

### Assignment Submission Policy

Both homework and R assignments will be due at 13:59 on Mondays (i.e., right before lecture). They are to be submitted via Blackboard. In general, late homework and R assignments will not be graded. However, we understand that life happens and that some weeks it will be difficult to complete the work on time; if extenuating circumstances do arise, please email the instructor and we will consider exceptions on a case-by-case basis.

### Grading Timeline

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

### Additional Policies

You can work together on the Homework and the R assignments (every student must submit their own assignment). You **cannot** work together on the exams. All examinations will occur as scheduled: there will be no make-up examinations. Note particularly that university regulations strictly regulate the final examination date.

We will be using a Blackboard Discussion Forum for this course. While all the instructors are happy to answer any questions during instructional periods or office hours, we will ask that if you would like to email us a *course-content related question*, that you do so using the Blackboard Forum, which we will be checking and responding to regularly. This is for two reasons: 1) if you have a question about a topic or an assignment problem, odds are pretty good one of your colleagues is also wondering the same — answering questions in public view will help everybody learn; and 2) we would like to encourage you to help each other — the best way to learn something is to try and explain it to someone else. We will be monitoring the forum and have a zero tolerance policy for any harassment or rude behavior on the Forum. If you have a question concerning your *personal circumstances* (e.g., regarding your grade or personal issues that affect your performance in the course), please email us directly and we will respond to your message promptly.

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.

## Course Schedule: A Weekly Breakdown

|         | Topics/Daily Activities                                                                                    | Readings                     | Deliverables        |
|---------|------------------------------------------------------------------------------------------------------------|------------------------------|---------------------|
| Week 1  | Introduction, Chapter 1<br>Chapter 2, Samples and Populations<br><br><b>Note: No Discussion for Week 1</b> | pp 1-26<br>pp 27-59          | No HW<br>No assign. |
| Week 2  | Chapter 2, Samples and Populations<br>Chapter 3, Probability and Binomial Distribution                     | pp 59-82<br>pp 83-93         | HW 1<br>No assign.  |
| Week 3  | Chapter 3, Probability and Binomial Distribution<br>Chapter 3, Probability and Binomial Distribution       | pp 94-102<br>pp 103-115      | HW 2<br>Assign. 1   |
| Week 4  | Chapter 4, Normal Distribution<br>Chapter 5, Sampling Distribution                                         | pp 122-140<br>pp 146-169     | HW 3<br>Assign. 2   |
| Week 5  | Chapter 5, Sampling distribution<br>Chapter 6; Confidence intervals                                        | pp 146-169<br>pp 171-204     | HW 4.<br>Assign. 3  |
| Week 6  | Midterm Review<br><b>Midterm 1 — Sept. 27</b>                                                              | None                         | HW 5.<br>Assign. 4  |
| Week 7  | Chapter 7, Comparing Two Independent Samples<br>Chapter 7, Comparing Two Independent Samples               | pp 223-248<br>pp 249-275     | No HW<br>No assign. |
| Week 8  | Chapter 8, Paired Test<br>Chapters 9, Goodness-of-fit;                                                     | pp 307-318<br>pp 355-365     | HW 6<br>Assign. 5   |
| Week 9  | Chapter 9, Chi-squared<br>Contingency analysis                                                             | pp 368-382<br>Not in book    | HW 7<br>Assign. 6   |
| Week 10 | Chapter 10, Relationships<br>Chapter 11, ANOVA                                                             | pp 383 – 412<br>pp 442 – 487 | HW 8<br>Assign. 7   |
| Week 11 | Chapter 12 Correlation, Linear regression<br>Chapter 12 Linear regression                                  | pp 511-560<br>pp 511-560     | HW 9<br>Assign. 8   |
| Week 12 | Midterm review<br><b>Midterm 2 — Nov 8</b>                                                                 | None                         | HW 10<br>Assign. 9  |
| Week 13 | Causal inference<br>Causal inference                                                                       | Not in text<br>Not in text   | No HW<br>No assign. |
| Week 14 | Multiple regression<br>No class Nov 22 — Thanksgiving                                                      | Not in text<br>None          | HW 11<br>Assign 10  |
| Week 15 | Modern computational techniques                                                                            | Not in text<br>Not in text   | HW 12<br>Assign 11  |

## 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.symlicity.com/care\\_report](http://usc-advocate.symlicity.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.