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

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Teaching Assistant: Rachel Wang
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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 an R assignment. In addition, there will be two midterm exams and one final exam.
Grading Breakdown

<table>
<thead>
<tr>
<th>Assessment Tool (assignments)</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework assignments</td>
<td>15</td>
</tr>
<tr>
<td>R assignments</td>
<td>10</td>
</tr>
<tr>
<td>Midterm 1</td>
<td>20</td>
</tr>
<tr>
<td>Midterm 2</td>
<td>20</td>
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<tr>
<td>Final</td>
<td>35</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
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**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

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