

Statistical Methods for Bioscience II Syllabus

University of Wisconsin - Madison, Statistics/F&W Ecology/Horticulture 572, Spring 2021

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office hours at BBCU:	T 1-3pm, W 11am-1pm, or by appointment	M 10am-12pm, F 12-1pm

Course Objective and Learning Outcomes:

As in Statistics 571, the goal is to provide students in bioscience with a thorough grounding in modern statistical procedures. The emphasis will be on understanding underlying concepts rather than on an extensive coverage of a wide range of topics. The development of the ability to interpret results and to evaluate critically the methods used is of paramount importance. To a large extent the assignments will involve the analysis of data sets that approach the “real-world” complexity of data encountered in research. Substantial use will be made of the computer in conducting such analyses.

Communication

Email

- I generally reply to email once or twice a day. Please expect an email reply within 24 business hours after you sent your email. If I don't reply after 48 business hours, please send a followup. Please consider this response time and plan ahead when you contact me. If something urgent arises, you may put [URGENT] in the subject line and I will do my best to reply as soon as possible.
- If you have a question that might pertain to other students, please post it on Piazza (see below).
- If you perceive my email tone as curt, please know that really I'm very warm and fuzzy [insert cuddly emoji here]. I just get a lot of emails and I am a slow typer so I often write fewer words than are necessary to communicate a nurturing feel. If I ever offend you, please let me know so that I can try to right the wrong.

Piazza

- As the main platform for asking and answering questions asynchronously, we are going to use Piazza (an app that is available through Canvas).
- The Piazza forum will be the most efficient way for students to ask general questions, because it allows for asynchronous communication, and it allows for having discussions if a similar question should arise multiple times. Students are also encouraged to help other students on Piazza. Asking homework-related questions on Piazza is permitted and encouraged. However, sharing full or partial homework solutions with other students on Piazza is prohibited and will be penalized.

Lecture time and location (Remote Asynchronous):

Course material (quizzes, lectures, homework) will be delivered every Friday to be completely asynchronously the following week.

Requisites:

F&W ECOL/HORT/STAT 571 or graduate/professional standing. Proficiency with material from F&W ECOL / HORT / STAT 571 will be assumed.

Description:

Polynomial regression, multiple regression, two-way ANOVA with and without interaction, split-plot design, subsampling, analysis of covariance, elementary sampling, introduction to bioassay.

Tentative Topics:

- **Continuing Simple Linear Regression:** Assessing assumptions, examining residuals, remedies for violated assumptions. (Chs. 1 & 2)
- **Multiple Linear Regression (MLR):** Fitting, evaluating, interpreting and testing. Sums of squares, multicollinearity, polynomial regression, qualitative predictors. (Chs. 3-6)
- **Model Selection for MLR:** Measures of model quality, best subsets, sequential selection. (Ch. 7)
- **Logistic Regression:** Fitting, evaluating, interpreting, and testing. (Ch. 8)
- **Extending One-Way ANOVA:** Alternate model formulation, expected mean squares, power, contrasts. (Ch. 9)
- **Factorial Designs:** 2x2 and general designs. Estimating and interpreting main effects and interactions.(Ch. 10)
- **Block Designs:** Fitting, evaluating, interpreting. Randomized complete block designs, Latin squares, randomization. (Chs. 11 & 12)
- **Mixed Effects Models:** Fixed vs. random effects, subsampling, split-plot designs. (Chs. 13 & 14)

Text:

Reference materials will be provided via Canvas files.

Grading:

Your grade will be based on homework, quizzes, projects and a final exam. The homework will count 26%, the quizzes will count 25%, the two projects will count 12% each, and the final will count 25%.

	Homework	Quizzes	Projects	Final Exam
Percent	26	25	24	25
Collaborative/Independent Cognitive Level	Collaborative Apply	Independent Remember	Collaborative Evaluate	Independent Analyze

Homework:

- Homework will be worth 26% of your grade.
- Homework assignments are due each week on Friday, on canvas, by 4:00 pm. Late homeworks will be graded for half credit if they are received before the TA begins grading. Credit will not be given for homework turned in after the TA begins grading.
- Homework assignments must pdf documents generated from R markdown. Photos of handwritten work may be embedded into the document as images (use the smallest file size possible).
- Homework assignments should be well organized and neat. It is required that you show your work in order to receive credit. For problems involving R, this may require providing the code and/or output obtained. Any code or output provided should be edited for neatness and readability.
- You are encouraged to discuss homework problems with others. Each student will be assigned a homework group with whom they should schedule a weekly meeting to discuss homework assignments. Working with peers is a great way for students to gain new perspectives on the course material and will provide them with an opportunity to gain fluency discussing statistical concepts. Students are required to include the names of any peers they collaborate with on an assignment and will be awarded 1 point of bonus credit to augment their assignment scores for each classmate they work with on an assignment (up to a maximum of 6 points and a score of 100% on the assignment).
- While collaboration is highly encouraged, you must write up your homework solutions by yourself in order to receive credit.
- Homework assignments may have different weights, depending on the effort needed to complete them.
- The lowest score will be dropped when computing an average score for your homework at the end of the semester. Please use this “drop one” policy wisely. This policy excludes the first homework assignment: the previous semester’s stat 571 exam.
- Submit your homework electronically on canvas. To submit, click on the assignments tab, then click the assignment you want to submit. Click the blue box near the top right labeled ‘submit assignment.’ On the ‘select submission type’ screen, click on the ‘file upload’ tab, then click ‘choose file’ to browse for the file. You may add comments for the grader if desired, then click the ‘submit assignment’ box. Give canvas a little time, then look in the top right for confirmation that the assignment was received.
- Homework will be marked late after the submission deadline, so please plan ahead. It is recommended you begin the submission process at least 5 minutes prior to the submission deadline, since it sometimes takes some time for canvas to accept an assignment. Any assignments that are not received by the submission deadline will be late.

- Assignments will be graded electronically. You can view any comments or annotations on canvas by clicking on grades, then the assignment. for comments, click on the comments icon, or for annotations, click the assignment name, then 'view feedback.'
- You must show work to receive full credit.
- Unless otherwise specified by a problem, you can always use either R or tables A, B, C, or D to compute probabilities.
- If, for some reason, you seek exception to any of the above policies, please email the TA and CC the instructor. The TA has authority to make decisions about homework policy exceptions. If you are not pleased with the TA's decision, you may appeal it with the instructor.

Quizzes:

- There will be 14 quizzes - one for each week of class.
- Quizzes will be based on readings (syllabus and course notes)
- Quizzes will be worth 25% of your grade.
- Each quiz will have around 10 questions aimed to ensure you have read the material. The weight of each quiz will correspond to the number of questions on the quiz.
- You will not be able to access lecture videos for a week until you have taken the corresponding quiz.
- You will have up to 2 attempts to complete each quiz. Your final score will be the average of your attempts.
- Quizzes must be done completely independently. Collaboration of any kind is strictly prohibited. Students will take quizzes at different times and so quizzes should not be discussed amongst students. Ask the instructor via email if you have any questions regarding a quiz. Please do not post on piazza any information that might assist fellow students with the quiz.

Projects

- There will be two collaborative projects, each worth 12% of your final grade.
- The first project is due March 19, the second is due April 16. Please mark your calendars.
- Each project will consist of solving a more complex analysis problem that approaches real world challenges.
- The reproducible report you submit must be written entirely by you.
- The goal of this collaborative approach is to ensure that all students have greatest opportunity to learn and find the correct answer(s).
- Use the opportunity to collaborate, not plagiarize.
 - The instructor reserves the right to oral examinations, and may use peer evaluations of groups to identify who to orally examine.

- Do not write anything in your report that you do not completely and fully understand. If you cannot verbally explain your entire report (choice of language, statistical decisions, R code, etc.) and similar work appears in another student's report, the instructor may allege academic misconduct against you and report the matter to the Office of Student Conduct and Community Standards. Sanctions for graduate students can be severe.

Exam:

There will be a final exam worth 25% of your grade. The final exam will be a multiple choice, multiple answer, true/false and short answer exam administered via canvas that will cumulatively cover lecture materials, readings, and homework material. The emphasis will be on synthesizing material from across the semester to demonstrate higher level learning (beyond remembering and applying). The exam will be open-book and open-notes. The final exam will take place on **Tuesday May 4, 2021**. The university assigned time for the exam is 7:25 - 9:25 pm, this may be expanded to a larger window. Block the day and time for the exam now — missed exams will not be permitted except when extenuating circumstances prevail. Vacation travel does not constitute an acceptable reason for missing an exam.

Campus Spaces for Virtual Learning & Testing

Dedicated on-campus spaces with high-speed internet are available for students to reserve for any exam/quiz taken during the semester. Computers can also be requested.

Discussion Sections (Remote Synchronous):

Attendance is strongly advised. It's the best place to ask questions in a small group, to connect with other students and form study groups, to get practice of new concepts, and get help with computing questions. Discussions WILL meet the first week of class, so the first discussion will be on January 28th, 2021.

You may attend a discussion for which you are not officially enrolled, but try to attend the same section most of the time, and approve any switch with your TA.

section times

311	312	313
R 12:05PM - 12:55PM	R 8:50AM - 9:40AM	R 9:55AM - 10:45AM

Credit Information:

This course is 4 credits. The course will have about 150 minutes of lecture videos and one synchronous 50-minute discussion section each week. In addition to lecture and discussion, it is expected that students will work on course learning activities (readings, quizzes, homeworks, projects, studying, etc.) for about another 2 hours a week for every class credit. This is around 12 hours of work per week.

Computing:

We will be using R through an R interface called R Studio. R is a free, open-source, and extremely flexible package, and is available for download online at: www.cran.r-project.org/. R Studio is available for free from www.rstudio.com/products/rstudio/download/#download. Some experience

with R will be expected, as R should be familiar from 571. In past years, SAS was also taught. This is the first year we will fully transition to R. If you are interested in SAS please contact the instructor.

Academic Calendar and Religious Observances

See: <https://secfac.wisc.edu/academic-calendar/#religious-observances>

Academic Integrity

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but are not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion. For detailed information, please see: <https://conduct.students.wisc.edu/academic-misconduct/>. Stronger disciplinary actions are more likely for graduate students than undergraduates.

Standards of Ethical Conduct in Data Analysis and Data Privacy

The members of the faculty of the Department of Statistics at UW-Madison uphold the highest ethical standards of teaching, data, and research. They expect their students to uphold the same standards of ethical conduct. Standards of ethical conduct in data analysis and data privacy are detailed on the ASA website: <https://www.amstat.org/ASA/Your-Career/Ethical-Guidelines-for-Statistical-Practice.aspx>, and include:

- Use methodology and data that are relevant and appropriate; without favoritism or prejudice; and in a manner intended to produce valid, interpretable, and reproducible results.
- Be candid about any known or suspected limitations, defects, or biases in the data that may affect the integrity or reliability of the analysis. Obviously, never modify or falsify data.
- Protect the privacy and confidentiality of research subjects and data concerning them, whether obtained from the subjects directly, other persons, or existing records.

By registering for this course, you are implicitly agreeing to conduct yourself with the utmost integrity throughout the semester.

Accommodations for Students with Disabilities

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform instructors of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Instructors will work either directly with

the student or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Diversity and Inclusion

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background - people who as students, faculty, and staff serve Wisconsin and the world.

Complaints

If you have a complaint about a TA or course instructor, you should feel free to discuss the matter directly with the TA or instructor. If the complaint is about the TA and you do not feel comfortable discussing it with him or her, you should discuss it with the course instructor. Complaints about mistakes in grading should be resolved with the instructor or TA, as appropriate, in the great majority of cases. If the complaint is about the instructor (other than ordinary grading questions) and you do not feel comfortable discussing it with him or her, contact the Statistics Director of Undergraduate Studies, Professor Cecile Ane, cecile.ane@wisc.edu. If your complaint concerns sexual harassment, please see campus resources listed at <https://compliance.wisc.edu/titleix/resources/>. In particular, there are a number of options to speak to someone confidentially. If you have concerns about climate or bias in this class, or if you wish to report an incident of bias or hate that has occurred in class, you may contact the Chair of the Statistics Department Climate and Diversity Committee, Professor Karl Rohe (karlrohe@stat.wisc.edu). You may also use the University's bias incident reporting system, which you can reach at <https://doso.students.wisc.edu/bias-or-hate-reporting/>.

Course Evaluations

UW-Madison now uses an online course evaluation survey tool, AEFIS. In most instances, you will receive an official email two weeks prior to the end of the semester when your course evaluation is available. You will receive a link to log into the course evaluation with your NetID where you can complete the evaluation and submit it, anonymously. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

Designations:

Level - Intermediate L&S

Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Instructional Mode

Remote/online

Students' Rules, Rights & Responsibilities

During the global COVID-19 pandemic, we must prioritize our collective health and safety to keep ourselves, our campus, and our community safe. As a university community, we must work together to prevent the spread of the virus and to promote the collective health and welfare of our campus and surrounding community. See also: <https://guide.wisc.edu/graduate/>

Campus COVID-19 Website: <https://covidresponse.wisc.edu/>

Guidance, protocols, and policies surrounding COVID-19 are important to follow and also likely to change throughout the course of the semester. Please be sure to review campus' COVID-19 website and follow best practice to help keep yourself and our community healthy.