

COURSE SYLLABUS

BIOL827: Biological Statistics

Department of Biology, University of Nebraska-Kearney

Term: Fall 2021
Course Credits: 3
Course Delivery: Online - Asynchronous

Instructor

Dr. Jayne Jonas, UNK Department of Biology, jonasj@unk.edu, office: 308.865.8224

Zoom office hours: Wednesdays 1:30 pm – 2:30 pm, or by appointment.

Please contact me any time with questions or concerns. If emailing outside of Canvas, please include BIOL827 in the subject line to ensure a timely response. I respond to messages as quickly as I can, generally within 24-48 hours.

Course Overview

This class is divided into two main areas. The first is biological statistics: the collection and analysis of scientific data. The second area is experimental design: how an experimental hypothesis is built and what are the pieces and procedures needed to conduct a successful experiment. The class is not mathematically intensive and relies on the power of computers beyond a few examples done by hand. The class includes both parametric and non-parametric statistics with continuous and categorical variables. Per the [UNK Graduate Course Catalog](#).

Course Learning Objectives

At the completion of the course, you will be able to

1. Identify best practices for data management, including creation of metadata, to ensure longevity of datasets.
2. Construct testable hypotheses about biological systems and identify appropriate experimental designs to statistically test those hypotheses.
3. Calculate descriptive statistics to examine the character of a dataset and evaluate statistical power.
4. Conduct and interpret results of standard statistical tests as appropriate for the experimental design used and data collected.
5. Apply statistical concepts in critically evaluating research conducted by others.
6. Communicate research results that are accurately, concisely, and straightforwardly supported by statistics.

Required Texts and Materials

- Whitlock, M.C., Schluter, D. The Analysis of Biological Data. Freeman-Macmillan, New York.
 - 2015 Second edition (preferred), OR 2020 Third edition
- Some required and optional reading materials may be provided via the Library Reserves or require accessing via Library citation finder.
- Any other course readings, website, and interactives (required or optional) will be posted for download or linked on the Learning Materials pages in Canvas.

Required Technology

- As an online course, access to an up-to-date computer and [Canvas](#) several times a week is required (checking in daily is encouraged).
 - Use of an obsolete computer operating system may hinder functionality of both Canvas and RStudio.
 - All Canvas quizzes should be completed from a computer browser. Issues may arise if the Canvas mobile app or browser on a mobile device is used to complete quizzes.
- Application of concepts via statistical software is central to both current research practice and critical evaluation of scientific literature. Familiarity with statistical computing is also seen as a valuable skill by many employers in the biological sciences. In this course, we will use the [R program](#) implemented using the free software [RStudio Desktop](#). Both are available for Windows, Mac, and Linux operating systems. Although current builds of RStudio are designed for 64-bit computers, you can download and install an older build of RStudio compatible with 32-bit computers. **Please install both software programs** prior to beginning Module 1. No prior knowledge of or experience with this software is needed at the beginning of the course – we will start from square one and work on building skills incrementally during the semester. For issues with R/RStudio, please contact the instructor.
- To complete some assignments, you will need to use a word processing software, such as Microsoft Word, Apple Pages, or [Google Docs](#).
 - Word processing programs include tools for typing equations; you should familiarize yourself with the equation editor in the word processing software of your choice. The equation editor is launched by selecting 'Equation' from the 'Insert' menu in all three word-processing programs listed above.
 - [Microsoft 365](#) software is available to UNK students for free download.
- Familiarity with spreadsheet programs such as Microsoft Excel or Google Sheets is helpful but not necessary.
- Ability to use search engines (for example, [Google Scholar](#) or [LoperSearch](#)) to locate scholarly works is expected. You will practice this skill during the semester. If you are not already comfortable, I encourage you to reach out to the [Natural Sciences Librarian](#) at Calvin Library for assistance as needed.
- For issues with Canvas or other technologies associated with your university account, please contact the [University technology help desk](#).

Important University Dates

- First day of class: August 23, 2021
- Last day to Add/Drop Classes Without an Override: August 27, 2021
- Late registration closes: September 10, 2021
- Withdrawal deadline: October 22, 2021
- Finals Week: December 13 – 16, 2021
- See the [UNK Academic Calendar](#) for other important University dates

Course Organization

There are 16 content modules in this course. One module will be presented each week (Monday 12:01 am to Sunday 11:59 pm) around a particular topic with content consisting of module learning objectives, a set of mini-lectures, assigned readings, and any other assigned learning materials. Optional materials may also be provided. All materials will be posted or linked in Canvas.

Participation

As a 3-credit course, it is expected that you will spend approximately [9-12 hours per week working on course-related activities](#). I encourage you to spend at least a little time each day on this course though I recognize this is not always possible. The more students are engaged in a course, the more they tend to get out of it.

Course Assessments

All work is assigned to all students and due by 11:59 p.m. Central Time on the date listed in Canvas and on the course schedule, unless otherwise indicated. If there is a discrepancy between the course schedule and Canvas, the date in the course schedule takes precedence.

Discussions

Discussion participation: Module discussions provide students an opportunity to examine, discuss, and apply concepts presented in each module with one another. Importantly, they also allow students to support one another in learning. Students are expected to uphold [UNK Values](#) and any other principles of community identified by your group to establish the discussion board as a supportive and inclusive learning space.

You will be expected to compose at least **three posts** for each discussion (more are encouraged!): one in direct response to a discussion prompt on or before **Thursday** and two in response to threads generated by other students on or before **Sunday** of the assigned module week. The grading rubric and information regarding expectations for discussion participation is available in Canvas. Participation in each discussion is worth 10 points. There will be 15 graded discussions during the semester, the lowest discussion score will be dropped (i.e., 14 discussion scores will count toward the semester grade).

The instructor will follow discussions throughout each module. However, being cognizant that students will be posting at different times during the week and not wanting to steer discussion, the instructor will make limited contributions to discussions unless there are areas in need of immediate attention. Following each module, a summary of group

discussions will be posted by the discussion leader (see below) to the corresponding Discussion Recap page; the instructor will provide feedback and insight (if any) to the Discussion Recap page.

Discussion leading: Each student will be assigned **one module to lead discussion** (40 points). Student leaders are also expected to participate in and will receive a separate participation grade for discussions they are assigned to lead.

Discussion leaders are expected to find a peer-reviewed scholarly work (journal article, book chapter, etc.) relevant to the topic of that module and pose two to three thought-provoking questions related to the module topic for their group to discuss. The discussion paper may be about the topic/concept itself or an example of its application in a biological context. These materials are due to be posted to the discussion board by the discussion leader no later than 5 pm Central Time on **Tuesday of the assigned module**. At the conclusion of the module, the leader will write a *brief* summary highlighting the main points discussed by the group and post it to the Discussion Recap page of the corresponding module by the **Tuesday of the following week**.

Discussion leading schedules, grading rubric, and additional instructions for discussion leading are available in the Discussion Leading Assignment in Canvas.

Problem sets

Each module will have a 15-point problem set assigned except modules covered in the week of a unit exam. Problem sets will provide students practice working with concepts relevant to each module, handling data, conducting analyses in R, interpreting output produced by R, or any combination thereof. Each will be due by 11:59 pm on the **Sunday** of the assigned Module. Instructions for each problem set are or will be posted on the corresponding assignment page in Canvas. There will be a total of 13 graded problem sets, with the lowest score being dropped (i.e., 12 scores will contribute to the semester grade).

A file with detailed instructions will be provided for each problem set in Canvas. Students are expected to read and follow these instructions. Students may work through problem sets collaboratively, but each student must submit their own unique work and will be responsible for knowing that material on quizzes and exams.

Most problem sets will be submitted by entering responses to the questions from the instructions file into a Canvas Quiz format. If there is a discrepancy between the instructions document and the Canvas quiz form, the instructions document takes precedence. When entering problem set responses into a Canvas quiz form, students will not have a time limit in which to complete the assignment or be limited in the number of attempts (the last submission will be graded) until the due date/time.

Quizzes

There is a 15-point quiz related to the learning objectives of each module, except in modules with a scheduled exam. Quizzes are to be completed by each student independently (i.e., no collaboration with others). They may require students to refer to tables in the text or other materials provided in the module, and may include simple calculations requiring a calculator or spreadsheet.

Weekly quizzes will be available 12:01 am Wednesday through 11:59 pm **Saturday**. Quizzes are open book/note (no proctor needed), students will not be able to stop then resume once started. Once started, students will have 20 minutes to submit. Students will have two attempts to take each quiz (latest submission graded). Of the 14 weekly quizzes, the 2 lowest scores will be dropped (i.e., 12 scores will contribute to the semester grade).

Important note: Canvas quizzes should be completed from a computer browser. Issues may arise when using the Canvas mobile app or browser on a mobile device for quizzes.

Exams

There are two unit exams worth 90 points each and a comprehensive final worth 180 points. All exams have three components:

- 1) a traditional timed exam (~40% of exam total),
- 2) a “take-home” problem set (~40% of the exam total), and
- 3) a paper critique (~20% of the exam total).

All exam components are to be completed by each student independently (i.e., no collaboration). Components will be submitted as separately via Canvas (see below). Timed exams are open note/open book (proctor not required). Students have one attempt to take the timed exam and will not be able to stop then resume once started. Specific instructions and expectations for the problem set and critique will be provided in Canvas approximately one-week prior to being due. The instructor will try to offer extended office hours during exam modules; additional office hours will be posted in Canvas.

For unit exams (Modules 5, 11): The timed exam will be due by 11:59 pm **Saturday**, and the take-home and paper critique will be due by 11:59 pm **Sunday** of the assigned module. Once started, students have 75 minutes to complete each timed component of the unit exam. Specific instructions for the problem set and critique will be provided approximately one week prior to being due. Unit exams will cover material relevant to learning objectives of each module in the unit, including the module in which the exam occurs. Exams will focus on material covered in each unit, but they will be cumulative in so far as the material in the course builds upon previously covered material.

For the final exam (Module 17): The paper critique will be due by 11:59pm on **Tuesday**. The timed exam portion of the comprehensive final (160 points) will be available only on **Wednesday (12:01 am to 11:59 pm)**; once started, students will have 90 minutes to complete the timed portion of the final exam. The take-home problem set will be due by 11:59 pm on **Thursday**.

Basis for final grade

Assessments and point distribution*	Points	% of grade
Module discussions	180	20%
Participation (15 @ 10 points each, 1 dropped)	140	
Leading (1 @ 40 points each)	40	
Weekly problem sets	180	20%
(13 @ 15 points each, 1 dropped)		
Quizzes/Exams	540	60%
Quizzes (14 @ 15 points each, 2 dropped)	180	
Unit exams (2 @ 90 points each)	180	
Final exam	180	
Total	900	100 %

*Adjustments may be made if deemed necessary by the instructor

Final letter grades will be assigned following a straight letter scheme (i.e., no +/- except as described under Grading Policy below) as follows:

A: 90 - 100%	D: 60 - < 70%
B: 80 - < 90%	F: < 60%
C: 70 - < 80%	

Course Policies

I take my role as your instructor very seriously; I care about how well you do in this course and that you have a challenging and rewarding experience.

Grading Policy

It is my commitment to you to respond individually to the work you submit in this class and to return your work promptly. Discussions, problem sets, and weekly quizzes will be returned within five days. Exams will be returned within seven days. If grading will take longer than the times listed here, I will keep you informed of my progress and return your work as soon as I can.

If you think there was a grading error or do not understand the feedback you receive on graded work, please contact me as soon as possible and no more than five days after the graded work has been returned to you to be regraded. Regrade requests may result in a lower grade.

Accommodations for cases in which an end of semester grade percentage falls within 0.50% of the next highest letter grade must be requested by the student and will be decided based on participation and engagement throughout the semester. When granted, course letter grade accommodations will result in a half-letter increase (for example, instead of a B an accommodated student would receive an A-). Accommodations will not be considered for semester grade percentages more than 0.50% from the next letter grade.

Late Work Policy

As a student enrolled in this course, one of your responsibilities is to submit course work by the due dates listed in the Course Schedule. With that said, 1 discussion participation, 2 weekly quiz, and 2 weekly problem set scores will be dropped because I recognize there may be times when you are unable to complete or submit these tasks on time. Canvas automatically adjusts your course grade throughout the semester to reflect dropping these values.

Quizzes and exams: These assessments must be completed within the designated timeframe. Quizzes and exams will not be accepted late unless prior arrangements have been made due to *documented* professional or extenuating circumstances (e.g., family emergency, participation in University-sanctioned activities, religious observation, etc.). Contact the instructor as soon as possible.

Discussions, Assignments, Literature Review: These assigned works will be penalized one letter grade (10% of points possible on assignment) for each day late unless arrangements have been made prior to the due date or there are *documented* professional or extenuating circumstances (e.g., family emergency, participation in University-sanctioned activities, religious observation, etc.). Late assignments will be accepted up to 4 days late. If more than 4 days late, the assignment will not be accepted and a grade of 0 (zero) will be recorded for that assignment. Contact the instructor as soon as possible.

Extra Credit Policy

Extra credit opportunities may be provided at the discretion of the instructor.

Final Exam Policy

Final examination week is part of the regular semester. Student attendance shall be consistent with University policy.

Professionalism Policy

Students are expected to uphold [UNK Values](#) and any principles of community identified by the class or your group to establish the course as a supportive and inclusive learning space. You are expected to be engaged in the course, conduct yourself with integrity, and treat others with respect and inclusivity. Critical questions and discussion to advance knowledge and understanding are strongly encouraged as long as they are done in a respectful way. Students who habitually disturb the class and have been warned may suffer a reduction in their final class grade.

Academic Integrity

Academic integrity is a term that encapsulates honesty, trust, fairness, respect, and responsibility among students and faculty. You are expected to follow the [University of Nebraska Student Code of Conduct](#). In particular,

“Students are expected to approach and complete their academic work with integrity. They are expected to do their own work, to be honest in the statements they make, to refrain from harming others, to refrain from improperly helping others, and to follow the rules.

Students must read instructions and syllabi carefully so that they know what their instructors expect in terms of academic integrity.

Students who are unsure whether or not particular conduct is appropriate should ask their instructors or university administrators. Failing to act with integrity is a violation of the Code." (Student Code of Conduct, Section IIA)

You may be asked to affirm the statement as true on submitted work: ***"By submitting this test or assignment, I unequivocally state that all work is entirely my own and does not violate UNK's Academic Integrity policy."***

Plagiarism: It is of utmost importance in this course to understand and avoid plagiarism. Writing discussion posts and paper critiques are a core feature of this course. TurnItIn may be used for assignments submitted in Canvas. For more information and tips, please visit the TurnItIn's webpage "[Preventing Plagiarism when Writing](#)" or reach out to the instructor for guidance. If you plagiarize in your submitted work you could lose credit for the plagiarized work, fail the assignment, or fail the course. Each instance of plagiarism, classroom cheating, and other types of academic dishonesty will be addressed in accordance with the [UNK Academic Integrity policy](#).

Students with Disabilities or Who are Pregnant

It is the policy of the University of Nebraska at Kearney to provide flexible and individualized reasonable accommodation to students with documented disabilities. To receive accommodation services for a disability, students must be registered with the UNK Disabilities Services for Students (DSS) office, 175 Memorial Student Affairs Building, 308-865-8214 or unkdso@unk.edu

It is the policy of the University of Nebraska at Kearney to provide flexible and individualized reasonable accommodation to students who are pregnant. To receive accommodation services due to pregnancy, students must contact Cindy Ference in Student Health, 308-865-8219. For more information regarding pregnancy rights: <http://www.nwlc.org/resource/pregnant-and-parenting-students-rights-faqs-college-and-graduate-students>

Reporting Student Sexual Harassment, Sexual Violence or Sexual Assault

Reporting allegations of rape, domestic violence, dating violence, sexual assault, sexual harassment, and stalking enables the University to promptly provide support to the impacted student(s), and to take appropriate action to prevent a recurrence of such sexual misconduct and protect the campus community. Confidentiality will be respected to the greatest degree possible. Retaliation against the student making the report, whether by students or University employees, will not be tolerated. Any student who believes she or he may be the victim of sexual misconduct is encouraged to report to one or more of the following resources:

- **Local Domestic Violence, Sexual Assault Advocacy Agency** 308-237-2599
- **Campus Police (or Security)** 308-865-8911
- **Title IX Coordinator** 308-865-8655

UNK Statement of Diversity & Inclusion

UNK stands in solidarity and unity with our students of color, our LatinX and international students, our LGBTQIA+ students and students from other marginalized groups in opposition to racism and prejudice in any form, wherever it may exist. It is the job of institutions of higher education, indeed their duty, to provide a haven for the safe and meaningful exchange of ideas and to support peaceful disagreement and discussion. In our classes, we strive to maintain a positive learning environment based upon open communication and mutual respect. UNK does not discriminate on the basis of race, color, national origin, age, religion, sex, gender, sexual orientation, disability or political affiliation. Respect for the diversity of our backgrounds and varied life experiences is essential to learning from our similarities as well as our differences. The following link provides resources and other information regarding D&I: <https://www.unk.edu/about/equity-access-diversity.php>