University of Colorado Denver   College of Liberal Arts and Sciences

BIOL 3763 – Spring 2020

Introduction to Biostatistics

Course Catalog Description: Introduces statistical thinking in biology. Emphasizes data exploration and probability-based inference methods including estimation, testing, and confronting models with data. Concepts and examples for general and applied biology, including ecology and the health sciences. Includes exposure to statistical software.

Logistics

Instructor:	Gregory Ragland, Ph.D.	**Office:** Science 4113	
E-Mail:	Use Canvas messaging (see below)	**Phone:** 303-315-7673	
Course time:	Lecture: Mon., Wed. 3:30 PM – 4:45 PM	Recitation: Wed. 12:30 – 1:45, 2:00 – 3:15	
Course location:	North Classroom 1535	**Canvas:** https://ucdenver.instructure.com/courses/422937	
Office Hours:	Mondays 1:00 – 2:30 PM or by appointment		

Prerequisites: BIOL 2051/2095, BIOL 2061/2097, BIOL 2071/2096, BIOL 2081/2098 with a grade of C- or higher, and MATH 1110, or MATH 1120, or 1130, or 1401, or MATH 2830 with a B or higher. It is assumed that students have a working understanding of general biology. This course is more conceptual and computational than mathematical, but it is assumed that students will be comfortable with algebra and basic mathematical notation. This prerequisite material will **not** be extensively reviewed in class. Please arrange to meet with the instructor if you are concerned about your preparation in any of these areas.

Course Communication: I will primarily use Canvas for all communications; please make sure your current email address is correct in Canvas, and that you have your settings adjusted to receive notifications**. Please do not e-mail me directly;** use the canvas messaging system, and ensure that 'BIOL3763' is in the subject line. I will bounce e-mails back to you and request that you use canvas. I am not trying to avoid you – this is the best way for me to be sure that your message does not get buried under the monstrous stack of regular e-mail I receive every day. Canvas messaging should primarily be used to arrange meetings outside of office hours. Any issues with grades or grade changes must be communicated in-person. Please do not message content-based questions; post those questions to the appropriate discussion forum on canvas, or attend office hours to discuss.

Required Materials:

The Analysis of Biological Data, **2ⁿᵈ Edition**
Whitlock and Schluter
WH Freeman and Company
ISBN: 9781936221486
This is the newest edition (make sure you get the **2ⁿᵈ edition**). The bookstore should have this book in stock.
Please also be aware of rental options, and electronic editions of this book, which may be more economical:
www.coursesmart.com, www.amazon.com, www.bn.com, etc.

Device with internet (or SMS text) access that you can bring to class.
In the past, I have occasionally used the free polling website, polleverywhere.com to supplement in-class exercises. This requires that you have a web-enabled device, such as a laptop, tablet, or smartphone, in class. You can also text in your answers. Note that you do **not** need an account to participate. Should you choose to create an account

with polleverywhere, then you may wish to view their privacy settings (including opt-out) at https://www.polleverywhere.com/privacy-policy. If you have questions about this or don't have such a device, please speak with the instructor right away. Bookmark this page: https://pollev.com/gregoryragla627 **Participation in these polls and interactive activities will directly address the learning objectives, i.e., participation will improve your performance in the course.**

Class Format: Class will consist of a combination of lectures, in-class activities, discussions, and student presentations. Attendance is important. I do not take attendance, but I will regularly give in-class quizzes. These are primarily to incentivize readings and help you track how well you are accomplishing learning objectives, but there will be points involved.

Instructor's Description

Statistics provides a framework that scientists use to quantitatively test hypotheses. Have you ever read a scientific paper and wondered how well the provided statistics (p-values, F-statistics, t-statistics, etc.) support the biological conclusions? Or how you would design a study to test a particular hypothesis? This course will provide a basic foundation in statistical thinking that will allow you, as future scientific professionals, to evaluate the results presented in scientific literature and to use standard techniques and models to conduct your own investigations. Whether or not you pursue a career that involves primary research, understanding the conceptual nuts and bolts of statistics will allow you to make important decisions about, e.g., your patients' health, your own health, and public health and environmental policy. The course will focus on the application rather than the derivation of models and methods, though we will spend some time on basic probability as the foundation of statistical inference.

The course will cover the broad topics of data description and visualization, probability, experimental design, inferential statistics, and common models of biological data. The course will be interactive, combining some lecture, lots of participation and discussion, and group projects that encourage creativity, exploration and collaboration.

Course Goals

By the end of the semester, students will be able to identify, interpret and evaluate the basic statistical designs, results, and conclusions that are commonly encountered in the biology and biomedical literature. Students will understand how the tenets of probability, good sampling design, and appropriate data analysis are used to inform conclusions based on the scientific method. They will be able to analyze and evaluate claims made in popular media, and will be able to communicate effectively with research professionals and statisticians.

Assessment

Grades will be based on the following assessments:

Assessment	Percentage of Final Grade
Exams (4 total)	50
Quizzes (6 minimum, drop lowest score)	10
Labs (10 total)	15
Online discussions (5 opportunities, must participate in 4)	5
Group project (30% progress reports, 65% presentation, 5% peer review)	20

Final grades will be based on the following standard scale:

A	93 – 100 %	Superior/Excellent	D+	67 – 69.9 %	Minimum passing
A-	90 – 92.9 %		D	63 – 66.9 %	
B+	87 – 89.9 %	Good/Better than average	D-	60 – 62.9 %	
B	83 – 86.9 %		F	< 60 %	Failing
B-	80 – 82.9 %				
C+	77 – 79.9 %	Competent/Average			
C	73 – 76.9 %				
C-	70 – 72.9 %				

You will have access to your grades via Canvas as we progress through the semester. Please note that there will be no negotiation about changes in final grades. A curve on the final grade will be implemented, at the instructor's discretion. I have rarely had to do this in the past, generally averages are well above 70%.

Grade Disputes: Any disputes with grades reported on the Canvas grade book for any assignment must be reported to the instructor _within 1 week_ of the grade being posted. Problems will be resolved in a timely manner.

Re-Grade Policy: Mistakes do occasionally happen while grading. Students will be offered the opportunity to request that specific exam or quiz questions be re-graded. Each requested question will be re-graded in its entirety. The instructor will add _or_ subtract points if too few or too many points, respectively, were awarded the first time the question was graded. **Re-grade requests must be made in-person during office hours or by appointment (see 'communication' section).**

No extra credit: The course assessment above is transparent, with many different assessments of how well you have accomplished the learning objectives. This is written into the syllabus to emphasize that this is not a flexible policy.

Exams

There will be four examinations during the semester, each covering roughly one quarter of the course material. Each exam will assess course knowledge using multiple choice and short answers. Questions will test your command of factual information learned from lecture and the assigned readings, as well as test your ability to synthesize the course content and creatively apply it to new problems. A good long-format answer will cohesively convey information, and not merely be a collection of relevant keywords. Answers to exam question will be evaluated using an answer key derived from the lecture notes and readings. Full credit for a question requires a comprehensive answer. The final exam will not be entirely comprehensive, and will cover materials between the 3rd and 4rth exams. However, that material may build on concepts developed earlier in the course.

I will make every effort to return exams by the third lecture period after the exam date.

Missed Examinations: Don't miss them. Excused absences will be granted for good cause, such as illness (certified by a doctor) or family or personal crisis (certified by Dean's Office, Counseling Center, etc.). Excused absences will not be granted for personal convenience or travel – if you have irreconcilable conflicts with our scheduled meeting times, please consider taking the course another semester when you are able to devote full effort and attention. In the event of an excused absence, I will grade you based on your scores for the three remaining exams; _there are no makeup exams!_

Reading assignments

Reading assignments from either the textbook or primary scientific literature will be posted on Canvas and on the course schedule. Every class meeting will include some interactive activities, and the readings will be assigned so that we can focus on critical thinking and problem solving in class rather than learning terminology and simple

concepts that appear in the readings. **In-class learning will be extremely difficult if you have not read the assigned material, and quizzes will typically include material from the readings.**

Quizzes

There will be a minimum of 6 quizzes during the course of the semester, but possibly up to 10. Some will be administered in class, some will be take-home, but all will assess your knowledge of assigned readings and/or topics covered in class or recitation. Quizzes administered in class will occur in the 1st 5 – 10 minutes, while quizzes on Canvas will be available for a set time window.

Problem sets

I will occasionally hand out problem sets that we may work through in class or at home. These will typically not be graded, unless they are part of a quiz (see below). These problem sets will model the types of questions that you will see on exams, and will evaluate how well you are mastering the learning objectives.

Class Participation

Students are expected to participate in class discussions and activities. This requires reading the assigned reading material **prior** to class, and will be periodically assessed with quizzes. Well-controlled studies have shown that **active participation by students leads to better grades, and better understanding of the course material**.

Online Discussions

Throughout the semester there will be 5 opportunities to read a paper on statistics and/or statistical philosophy, and carry out a group discussion online using the Canvas discussion features. I will elaborate on these assignments in class; the goal is for you to exchange peer-to-peer ideas that will help you to think more broadly, and help me to understand how you are conceptualizing the material. I will moderate if necessary, but ideally this will be purely a discussion amongst yourselves.

Group project

Groups of students will work together to identify a biological question, design an experiment, collect data, apply statistical analyses, interpret, and present. The project will develop over the course of the semester and will involve frequent progress reports and workshopping. Products will include a combination of brief written reports and oral presentations/discussions. Specific details will be discussed in class.

Late assignments

All written assignments will have clearly defined deadlines and will be submitted through Canvas. If a writing assignment is turned in after this time but within 24 hours of the due date, the assignment will receive a maximum of 90% of the possible points. Each subsequent 24 hour period that the assignment is late will further reduce the maximum possible points by 10%. You will need to make arrangements with me to turn in late assignments. **Late take-home quizzes will result in a 0, though you may drop your lowest score.**

Canvas course website

This class will use Canvas (See link at the top). Log in with your university user name and password (it should be the same as you use for your email). If you have any problems please contact cuonlinehelp@ucdenver.edu the first week of class. The instructor cannot provide IT support. Canvas will be used to post *some* lecture notes, and links to scientific articles and other readings aside from the text book. The site should be checked regularly for course-related announcements and discussions. **You should make sure that you are receiving notifications** (account settings in upper right banner, then click on "Notifications" in the left-hand navigation). If you want it to, Canvas will text you, email you, send you a private tweet, use facebook notifications -- there's no excuse for not knowing what's going on in the course.

Respect your fellow students

Please remember that the classroom should be an environment conducive to learning. I will treat you with respect; please also treat your fellow students with respect. All electronic devices with an audible signal must be silenced during class. Text messaging not related to class or talking on your phone during class is not acceptable; you will be asked to leave the class. Class begins and ends on time. Adherence to the University of Colorado Denver Student Code of Conduct is expected.

Academic Dishonesty

Academic dishonesty is a serious offense that diminishes the quality of scholarship and the learning experience for **everyone** on campus.

CLAS Academic Dishonesty Policy: Students are required to know, understand, and comply with the CU Denver Academic Dishonesty Policy as detailed on the CLAS website. Academic dishonesty consists of plagiarism, cheating, fabrication and falsification, multiple submission of the same work, misuse of academic materials, and complicity in academic dishonesty. If you are not familiar with the definitions of these offenses, or wish to learn more, go to http://www.ucdenver.edu/academics/colleges/CLAS/faculty-staff/policies/Pages/AcademicIntegrity.aspx. This course assumes your knowledge of these policies and definitions. Failure to adhere to them can result in penalties ranging from failure of the assignment or the course to dismissal from the University; be informed and be careful. If this is unclear to you, ask me.

Plagiarism: Writing assignments will be checked automatically (via software) and manually (by me) for plagiarism. Papers/Quizzes that plagiarize the work of others will receive no points, may result in an 'F' grade for the course, and will be referred to Academic Ethic Committee. Copying and pasting from any source is **not acceptable**. The **only** exception are brief quotes that 1) appear in quotations marks in your paper, and 2) are properly cited.

Other Administrative Issues

Access, Disability, Communication: The University of Colorado at Denver is committed to providing reasonable accommodation and access to programs and services for students with disabilities. To be eligible for accommodations, students must be registered with the UCD Office of Disability Resources and Services (DRS) (North Classroom 2514; 303-556-3450, 303-556-4766 (TTY)). The DRS staff has experience assisting faculty in determining reasonable academic accommodations and coordinating these accommodations. I am happy to provide approved academic accommodations outlined in the DRS letter.

Students Called for Military Duty: If you are a student in the military with the potential of being called to military service and /or training during the course of the semester, you are encouraged to contact your school/college Associate Dean or Advising Office immediately.

Campus Closure: In the event that the campus is closed for any reason, any scheduled exam, activity or deadline will automatically be rescheduled for the next meeting of the course and the course syllabus will be adjusted if necessary. Closures on Auraria are announced and updated by the campus operator, (303) 556-2401. Students are also encouraged to enroll in the Auraria Campus Emergency Notification System:

http://www.ucdenver.edu/about/departments/UniversityPolice/Emergency_Management/Pages/RAVE.aspx

Incomplete Grade Policy: Incomplete grades will not be granted to avoid an undesirable grade in the course. The faculty in the College of Liberal Arts and Sciences have passed the following policy relating to the awarding of Incomplete grades. This CLAS policy is consistent with the UCD campus policy.

Incomplete grades (IW or IF) are not granted for low academic performance. To be eligible for an Incomplete grade, students must (1) successfully complete 75 percent of the course, (2) have special circumstances (verification may be required) that preclude the student from attending class and completing graded assignments, and (3) make arrangements to complete missing assignments with the original instructor. A CLAS Course Completion Agreement is required. Completion of a CLAS Course Completion Agreement is strongly required. Incompletes cannot be awarded that stipulate: (1) a student may repeat the entire course, (2) repeat or replace existing grades, (3) allow the student an indeterminate period of time to complete a course, or (4) allow the student to repeat the course with a different instructor. The CLAS Course Completion Agreement is available from the CLAS Advising Office, North Classroom 4002.

Biology Department Grievance procedure: If a student has a grievance with any aspect of a course, the first step is to meet with the instructor during office hours or by appointment to discuss the problem. This discussion should not take place by e-mail. Student and instructor should both maintain a professional, respectful demeanor during this discussion, and make an honest effort to listen carefully and to understand the other's viewpoint. In laboratory courses, the next step in resolving a grievance after meeting with the teaching assistant may involve a discussion with the faculty member in charge of the laboratory course. If the grievance cannot be resolved by an honest and sincere dialogue between student and instructor, the student may then make an appointment to discuss the problem with the department chair. If still not satisfied, the student may appeal to the Associate Dean. No step in this process may be skipped. See also "Procedures for Student Grievances about Courses or Faculty, CLAS."

CLAS Academic Policies

For relevant university deadlines and procedures (such as the last day to withdraw from a course) as well as academic support sites, please see this website https://clas.ucdenver.edu/faculty-staff/sites/default/files/attached-files/student_services_and_calendar.pdf. "