

MATH 115: Quantitative Biology
Fall 2020

Professor: Dr. Maggie Rahmoeller (aka Dr. Maggie)
Office: Trexler 270J
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Class Meetings: MWF: 10:50 AM - 11:50 AM in Olin 231 OR via Zoom (personal preference by student)

Office Hours: All office hours will be via Zoom. Available time includes
MWF 9:30 – 10:30AM
T/TH 2:30 – 4:00PM

The Zoom link for office hours is:

<https://roanoke-edu.zoom.us/j/6576322388?pwd=UVU5OTRtUm9FSjhUR2wzbkI1ZGQxZz09>,

which can also be found on Inquire.

Course Description: This course is focused for students intending to pursue a degree in the biological sciences. The course builds upon statistics knowledge gained in INQ 240 and offers an introduction to mathematical modeling - both continuous and discrete. Students will learn how to apply appropriate models and statistical tests to a variety of situations.

Intended Learning Outcomes: By the end of this course, successful students will be able to:

- Given a research question or data set, choose an appropriate statistical test to use.
- Research, find, and utilize additional statistical tests outside of those found in INQ 240 or this course.
- Understand the concepts of a derivative and its importance in mathematical modeling.
- Understand the terms that appear in mathematical models relevant to biology and apply those models in appropriate ways.
- Understand the mathematics and statistics present in selected biology research papers.

Required Materials:

Textbook 1: Handbook of Biological Statistics; McDonald, <http://www.biostathandbook.com/>

Textbook 2: Mathematics for the Life Sciences; Bodine, Lenhart, and Gross Calculator (any type)

Laptop (Mac or Windows): We will use the statistical software R (RStudio), Excel, and the modeling software NetLogo for this class.

Commitment Hours: This course expects you to spend at least 12 hours of work each week inside and outside of class.

Grading: The following table lists the weights for the various forms of assessment for this class.

Homework / Assignments	10%	Tests	20%
Research Articles	15%	Case Study Explorations	30%
Project - Paper & Presentation	25%		

A grade scale will be determined after final grades are computed but will be no worse than the scale given below. Attendance and class participation will be considered when determining marginal grades.

A:	93-100	B:	83-87	C:	73-77	D:	63-67
A-:	90-93	B-:	80-83	C-:	70-73	D-:	60-63
B+:	87-90	C+:	77-80	D+:	67-70	F:	Below 60

Course Expectations

Class Structure: Students will attend class physically or virtually (student's personal preference). There will be some days, however, for which we all meet via Zoom (due to the nature of the activities in class). **Students are expected to complete work during class time every class period.**

In-Class Policies: Face masks must be worn over the mouth and nose by all students and instructors in classrooms and hallways of academic buildings (among other places). By wearing face coverings, we protect our college community and its most vulnerable members. Students who come to class without a face mask that is being worn properly will be asked to leave and will only be readmitted after they are wearing one.

Students will attempt to maintain a distance of 6 feet from other students and the instructor at all times. Students will limit side conversations (unless told to chat with others by instructor). Wearing masks makes hearing more difficult and we want to limit the amount of white noise.

Zoom Policies: Every student is expected to participate in Zoom days; and students not attending class physically are expected to attend via Zoom every class period. To download the Zoom Client for Meetings App, click here: <https://zoom.us/download>. If you scroll down, you will also see Zoom Mobile Apps - you can use the app on your phone. However, Zoom on a computer is better.

By *participate*, I mean:

- Your video will be on in such a way that I can see your face
- your Zoom name consists of your name (nickname is good) - both first and last
- you will stay muted unless you are asking a question or responding to a question
- you take notes, ask questions (either verbally or through chat), and are awake
- if I have you work in small groups through Zoom breakout sessions, you join your breakout group and collaborate with your group members

Attendance Policy: If you have a temperature of 100.4 or higher or other coronavirus symptoms, **don't attend class physically!** Call Health Services immediately. Do not go to any public area on campus!

Do keep up with all readings, assignments, and deadlines (everything will always be laid out on Inquire and in the tentative schedule - email me if you are unsure). **Do attend class via Zoom!!**

In order for your absence to be excused, you must give Health Services permission to notify me that you have consulted them about coronavirus symptoms (whether or not you actually have the virus). If Health Services informs you that you should isolate and not attend class for multiple days or weeks, inform me so that we can make a plan to keep you current in the course. Note - if you are in isolation, I expect you to be fully capable of keeping up with Zoom class meetings. I, of course, will always be available for Office Hours to help answer your questions about ANY of the material.

All absences caused by consultation with Health Services about coronavirus symptoms or isolation ordered by Health Services will be excused.

All non-coronavirus-related absences will be handled as follows. Any absence that is not discussed with the instructor prior to the missed class is considered unexcused. Unexcused absences may result in the lowering of the final grade (for example, a B to a B-), depending on the sheer number of absences. When absent, excused or unexcused, you are responsible for all material covered in class.

Late Work: This policy depends on the type of assignment:

- **Homework / Assignments** - These assignments will be due by the start of the following class. If an assignment is turned in later that day, 5% will be deducted. If they are turned in the next day, 15% will be deducted. I will not accept them for a grade after that. However, you may email me your work in order to receive feedback from me.
- **Research Articles** - If a research article assignment is turned in between 1 and 24 hours late, I will deduct 5% from your grade; between 24 and 48 hours late, I will deduct 10% from your grade; between 48 and 72 hours late, I will deduct 15% from your grade; and I won't accept it more than 72 hours (i.e. 3 days) after the time it's due.
- **Projects** - If your Statistics Project Paper is turned in between 1 and 24 hours late, I will deduct 10% from your grade; between 24 and 48 hours late, I will deduct 20% from your grade; and I won't accept it after 48 hours late. You cannot turn your Modeling Project Presentation in late - it's due when you present.
- **Tests** - These are due by the end of class. If you have accommodations, you must make plans with me at least 1 week in advance. If you are quarantined due to COVID, you must make plans with me to take your test outside of class. If COVID-nonsense happens the day of a test, you must get in touch with me ASAP to make plans.
- **Case Study Explorations** - If you turn these in between 5 and 60 minutes late, I will deduct 5% from your grade; between 1 and 12 hours late, I will deduct 10% from your grade; between 12 and 24 hours, I will deduct 20% from your grade; and I will not accept it after 24 hours late.

Academic Integrity: Students are expected to adhere to the Academic Integrity policies of Roanoke College (https://www.roanoke.edu/inside/a-z_index/academic_integrity). All work submitted for a grade is to be your own work! You may work with other students in your class on homework, but you must individually write up solutions. If you are looking at another person's work or asking someone what to do next while writing up your homework solutions, then you are in violation of the academic integrity policy of Roanoke College.

You are to complete the research article assignments and the tests individually.

You are encouraged to work with a partner on Case Study Explorations, and you are required to work with a partner on both projects (the statistics project and the modeling project), albeit different partners for each. Know that by including your name on these assignments along with your partner's, you are saying that you have both put in equal amounts of effort and collaborated to the best of your abilities. Use of Subject Tutoring is encouraged; however, students are not to work on test problems or case study explorations with Subject Tutoring until after deadlines for work submission have passed.

You may use any resources from Inquire (including videos, worksheets, solutions, resources, etc that are posted on our Inquire page) to help with any assignment. You may use your textbooks, a calculator, Excel, NetLogo, and/or RStudio to help with any assignment. You may ask me questions via email or a scheduled office hour appointment. BUT - you may NOT use any other internet source (no Google searches, no homework help sites, NOTHING) for tests or case study explorations.

What If ???

If the college is forced to suspend in-person attendance (as was done during Spring 2020), we will continue to meet via Zoom at our regular class time. I will distribute an amended syllabus. Instead of a hybrid structure, we will only have Zoom days. You will need internet connectivity. If you have technology challenges, I need you to email me as soon as the decision is made to go remote so that we may discuss how you will keep up with the course.

COURSE ASSIGNMENTS

Homework / Assignments: Homework will be assigned regularly in this class (virtually every class period) and may take several forms. Typically, it will be due at the start of the class period immediately following the assigning of the homework. Homework will be graded partly on effort and partly on correctness. Students will submit their work through Inquire.

Research Articles: You will examine 3 biology research papers. Two papers will be based on statistical analysis of data and the other will focus on mathematical modeling. Articles will be provided along with guided reading questions.

Project: There will be two projects for this course. The first project will assess your understanding of statistical analysis. The second project will assess your understanding of modeling a scenario based on assumptions about scientific principles that underlie the phenomena being modeled. For each project, you will work with a partner (different partner for each project). The first project will culminate in a paper (of the form of a biology research paper). The second project will culminate in a 10-15-minute presentation. Detailed information will be covered in class and posted on Inquire.

Tests: There will be two take home written tests. The first test will emphasize concepts about statistics (test selection - when to use what hypothesis test, assumptions for tests, data transformations, terminology, etc.). The second test will emphasize both concepts about modeling (describing differential equations, rates of change and instantaneous rates of change, equilibrium and stability, etc.) and computation for modeling. You will need your laptops to complete these tests.

Case Study Explorations: Six case studies will be explored using various computer programs. These will be conducted during class via Zoom, and you are encouraged to work with a partner. You typically will have time to finish the case studies outside of class time. But it is to your advantage to get as much completed as possible during class time.

Final Exam: Instead of a final exam, the exam slot will be used for the project 2 presentations and discussion. The exam slot is for Block 3, i.e. Friday, Nov 20 from 8AM - NOON.

Co-Curricular Activities: The MCSP department and Roanoke College offer many opportunities to engage with mathematical ideas outside of classes. Members of this class are encouraged to attend many of these activities, however attending at least one is mandatory. Examples include MCSP Conversation Series talks (all offered through Zoom this semester) and student research showcases (should they happen this semester) - if you're unsure if a given activity makes sense for this purpose, please email me to ask. **Within one week of attendance** you must submit a brief response to the activity. This should **not** simply be a regurgitation of the content, but rather a personal contemplation of the experience. Each response will be worth 10 points and will count toward your homework/assignments grade.

RESOURCES

Accessible Education Services (AES) is located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Laura Leonard, Assistant Director of Academic Services for Accessible Education, at **540-375-2247** or by e-mail at **aes@roanoke.edu** to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Laura Leonard at your earliest convenience to schedule an appointment..

Subject Tutoring: Subject Tutoring, located on the lower level of Fintel Library (Room 5), is open 4 pm - 9 pm, Sunday - Thursday. We are a Level II Internationally Certified Training Center through the College Reading and Learning Association (CRLA). Subject Tutors are friendly, highly-trained Roanoke College students who offer free, one-on-one tutorials in a variety of general education and major courses such as: Business, Economics, Mathematics, INQ 240, Modern Languages, Lab Sciences, INQ 250, and Social Sciences (see all available subjects at www.roanoke.edu/tutoring). Tutoring sessions are available in-person or online in 30- or 60-minute appointments (please specify if you prefer to meet with a tutor online or in-person when you make your appointment). All in-person appointments will maintain at least 6 feet of physical distance, desks will be cleaned between appointments, and masks must be worn in all indoor, public spaces. In the event that all classes go online this semester, Subject Tutoring will remain available online, too. Schedule an appointment at www.roanoke.edu/tutoring or contact us at 540-375-2590 or subject tutoring@roanoke.edu. We hope to see you soon!

The **Writing Center @ Roanoke College**, located on the Lower Level of Fintel Library, offers tutorials focused on writing projects and oral presentations for students working in any field. Writers and presenters at all levels of competence may consult the Writing Center at any point in their process - including brainstorming, drafting, organizing, editing, or polishing presentation skills - to talks with trained peer tutors in informal, one-on-one sessions. Schedule a virtual or in-person appointment by going to www.roanoke.edu/writingcenter, where our staff members and workshops are also posted. If it becomes necessary to temporarily discontinue face-to-face services at any time, online tutorials will still be available. **Questions?** Email writingcenter@roanoke.edu or call **540-375-4949**.