

Math 115: Quantitative Biology

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Student Help Hours (Also known as Office Hours) **Monday & Wednesday 10 - 10:40 am and 1:10 - 2 pm, Tuesday noon - 1 pm, or by appointment.** Drop by my office anytime during office hours - and let me know you're there even if I'm doing something else.

Course Description This course is designed 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.

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

- Choose an appropriate statistical test to use for a given a research question or data set.
- Research, find, and utilize additional statistical tests outside of those found in INQ 240 or this course.
- Understand the concept 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.

Course Materials Textbook: *Handbook of Biological Statistics 3rd edition*, McDonald (PDF available on Inquire)
Technology: Calculator (should be capable of taking square roots, cannot be a cell phone or computer),
Strongly Recommended: Laptop (not iPad or tablet)

Important Dates We will have six in-class quizzes and two presentations. Each quiz will focus on the material learned since the last quiz, but may (if necessary) contain previous material.

If you have a conflict with one of these dates please email me ASAP.

Quiz 1	Friday 1/23, in class
Quiz 2	Friday 2/6, in class
Quiz 3	Friday 2/23, in class
Statistics Project Presentation	Wednesday 2/25 & Friday 2/27, in class
Quiz 4	Friday 3/27, in class
Quiz 5	Friday 4/10, in class
Quiz 6	Tuesday 4/21, in class
Modeling Project Presentation	Friday 4/24, 8:30 – 11:30 am

Course Grades The final course grade is determined in the following way:

Statistics Project	20%
Statistics Project Presentation	10%
Statistics Project Reflection	5%
Modeling Project	20%
Modeling Project Presentation	10%
Modeling Project Reflection	5%
Quizzes (5% each)	30%

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.

		B+	88-89	C+	78-79	D+	68-69		
A	92-100	B	82-87	C	72-77	D	62-67	F	0-59
A-	90-91	B-	80-81	C-	70-71	D-	60-61		

Attendance Policy Class attendance is expected because doing well in this class is hard if you aren't here to work on the material with us. However, life happens and sometimes you have to miss. If you know in advance you're going to miss class, make sure you turn in any work due that day (Inquire makes this easy!). Let me know if you need help learning the material we're going to cover, whether that means getting connected with someone who will share their notes or coming to office hours with questions. If you are going to miss a quiz or presentation, let me know as soon as you can so we can figure out how to handle that. If you don't know in advance (because sometimes life happens unexpectedly), talk with me as soon as you can about what you can make up and how to get caught up. I will be as generous as I can while still keeping the class fair for all students.

Practice Assignments These will not be graded but are intended to provide you opportunities to practice applying the concepts discussed in class. They may involve computation, coding, and/or reading and interpreting. They are your chance to make sure you understand the material and to get help as soon as you realize you need it so that you can do well on your quizzes.

Projects 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 (a different partner for each project). Both projects culminate in presentations, write-ups, and reflections. Detailed information will be covered in class and posted on Inquire.

Mask Policy Anyone is welcome to wear a mask for some or all of the semester. **If you feel sick and plan to come to class, please wear a mask over your nose and mouth!** (The rest of the class thanks you in advance.)

Expected Work Policy This course expects you to spend at least 12 hours of work each week inside and outside of class.

Extra Resources Subject tutoring and writing help are available Sunday - Thursday from 4 - 9 pm at the Dr. Sandee McGlaun Writing Center and Subject Tutoring (in the lower level of Fintel Library). Stop by or schedule an appointment through Navigate ("Schedule an Appointment" → "Writing Center and Subject Tutoring" → "Writing Support" or "Course Tutoring" → preferred date and tutor.) Contact subject_tutoring@roanoke.edu or 540-375-2590 for more information.

Artificial Intelligence If you want to use generative artificial intelligence resources on a graded assignment, you will need to discuss it with me in advance. I may or may not agree depending on the assignment and your intended use. (You are welcome to use whatever resources you like on all ungraded work or to help study for tests.) **You may not upload any of our course assignments to any generative AI or "homework help" sites!**

Accommodations If you get any academic accommodations in this course, please let me know and provide your documentation as soon as you can - preferably within the first 2 weeks of the semester. (Check with the Center for Teaching and Learning for their scheduling guidelines.)

Academic Integrity I expect all of you to follow the Academic Integrity policies of Roanoke College. All graded work should be your own work! If you ever have questions about how these policies apply to our class please contact me. Any violations of our Academic Integrity policies will automatically be turned over to the Academic Integrity Council.

Course Schedule

The following schedule is approximate and subject to change except for the test dates. It should give you an idea of the timing of the topics covered and assignments.

Day	Date	Topic	Assignments (due by 11 pm unless specified)
M	J 12	Data	
W	J 14	Data Sets	
F	J 16	Posing Questions	
M	J 19	No Class (MLK day)	
W	J 21	Statistics Project Intro	
F	J 23	Quiz 1 / Project Work Day	Stats Project Setup due
M	J 26	Chi Square Test	
W	J 28	Project Work Day	Health Condition Source due by 10:50 am
F	J 30	Project Work Day	
M	F 2	t Tests / ANOVA	
W	F 4	ANOVA	Chi-Square Write Up due
F	F 6	Other Average Tests / Quiz 2	
M	F 9	Logistic Regression	Regression Setup due
W	F 11	Logistic Regression	
F	F 13	Project Work Day	
M	F 16	Project Work Day	
W	F 18	Regression Exploration	Regression Write Up due
F	F 20	Regression Exploration	Presentation draft due
M	F 23	Quiz 3 / Project Work Day	
W	F 25	Statistics Project Presentations	
F	F 27	Statistics Project Presentations	Presentation (final version) due by 3 pm Statistics Project Reflection due
Spring Break			
M	M 9	Intro to Modeling	
W	M 11	Modeling Project Intro	Modeling Project Setup due
F	M 13	M&M Data to Model	
M	M 16	M&M Data to Model	
W	M 18	Dynamic Equations	
F	M 20	Exponential Growth/Decay	Modeling Project Part 1 due
M	M 23	Double / Half Life	
W	M 25	Limitations & Graphs	
F	M 27	Quiz 4	
M	M 30	Other Equations & Model Assumptions	Modeling Project Part 2 due
W	A 1	Discrete Dynamical Systems	
F	A 3	No Class (Good Friday)	
M	A 6	Discrete Dynamical Systems	
W	A 8	Rates of Change	Modeling Project Part 3 due
F	A 10	Quiz 5	
M	A 13	Rates of Change	
W	A 15	Instantaneous Rates of Change	
F	A 17	Project Work Day	
M	A 20	Continuous Dynamic Equations	Modeling Project Part 4 due
Tu(F)	A 21	Quiz 6	
F	A 24	Modeling Project Presentations 8:30 – 11:30 am	Modeling Project Reflection due by 8:30 am