MATH 115, Spring 2018: Quantitative Biology

Instructors	Jan Minton Trexler Hall 461 *Email*: jminton@roanoke.edu	Dr. Maggie Rahmoeller Trexler Hall 270J *Email:* rahmoeller@roanoke.edu

Class Meetings	Mondays, Wednesdays, Fridays: 10:50 AM - 11:50 AM in Fintel Library Room 1

Office Hours	Jan 15 - Mar 2 By Appointment at jminton.youcanbook.me Mondays & Wednesdays: 3:00PM-4:30PM Tuesday &Thursdays: 1:00PM -2:30PM	Mar 12 - Apr 2 Mondays: TBD Wednesdays:TBD Thursdays: TBD

Course Information

This course provides a continuation of the statistics knowledge gained in INQ 240, focused for students intending to pursue a degree in the biological sciences, along with an introduction to calculus and mathematical modeling. Students will learn how to apply appropriate models and statistical tests to a variety of situations and will learn how to research other modes and tests out there to apply to their own research in the future. A focus of the course is using real data from the past work done by the biology faculty and students and on reading and understanding the models and statistics found in biological journals.

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 biology research papers.

Required Materials

Textbook 1: Mathematics for the Life Sciences; Bodine, Lenhart, and Gross
Textbook 2: Handbook of Biological Statistics; McDonald,
http://www.biostathandbook.com/
Supplemental Handouts provided by professors
Calculator: TI-83 Calculator, or similar (with graphing capabilities)

Course Grades

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

Assignments 25%

Project 25%

Tests 50%

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+	87-89	C+	77-79	D+	67-69		
A	93-100	B	83-86	C	73-76	D	63-66	F	0-59
A-	90-92	B-	80-82	C-	70-72	D-	60-62		

Participation and Make-Up Work

Students are expected to attend every class. 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-). When absent, excused or unexcused, you are responsible for all material covered in class. **You will not be allowed to make up any work missed due to an unexcused absence.**

Commitment Hours

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

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. Late homework is not accepted. If you miss class, get a friend to turn in your homework for you.

You will read research articles that use topics discussed in class, and answer specific reflective questions on the article. The aim of these assignments is to allow you to see how researchers utilize the methods discussed in class to learn about the world around them.

Occasionally, students will complete assignments in class that make use of computer software.

Project

There will be one semester-long project that will be divided into two parts. The first part will assess your understanding of modeling a scenario based on assumptions about scientific principles that underlie the phenomena being modeled. The second part will assess your understanding of experimental design and statistical analysis.

Tests

During the first half of the semester, there will be 3 standard individual tests. For the second half of the semester, there there will be weekly tests (aka case studies). However, they will have different forms - individual, group, etc. They will take place in the computer lab, and usually will require Minitab.

Final Exam

The final exam for this class is held during the scheduled time for the final exam for Block 3, i.e. **Monday, April 30 from 8:30-11:30AM.** This time will be used for the term project presentations and discussion.

MCSP Conversations

The MCSP Department offers a series of discussions that appeal to a broad range of interests related to these fields of study. These co-curricular sessions will engage the community to think about ongoing research, novel applications, and other issues that face our discipline. You are invited to be involved with all of these meetings; however, participation in **at least one** of these sessions is mandatory. After attending, students will submit a one-page paper to Inquire reflecting on the discussion. This should **NOT** be a regurgitation of the content, but rather a personal contemplation of the experience.
These reflections will be part of the assignments grade.

Study Room	The MCSP Study Room, Trexler 271, is a great place for you and your friends to meet in order to work on homework together or prepare for tests. It is open virtually 24 hours a day, 7 days a week (very occasionally there are meetings in that room). Your student ID card should grant you access to Trexler Hall at any time of day if the doors happen to be locked (use the card access point located by the first floor entrance facing the parking lot). Take advantage of this area and time, especially during weekdays when other faculty who are teaching calculus and statistics are around!
Academic Integrity	Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be your own work! No electronic devices other than your graphing calculator can be used during any class or testing period (this includes cell phones; please silence or turn them off before class). Note that looking at or using your cell phone during a test or quiz is considered a violation of AI regardless of your purpose or intent in doing so.
Disability Support Services	The Office of Disability Support Services, located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library, provides reasonable accommodations to students with identified disabilities. Reasonable accommodations are provided based on the diagnosed disability and the recommendations of the professional evaluator. Please contact JoAnn Stephens-Forrest, MSW, Coordinator of Disability Support Services, at 540-375-2247 or email her (stephens@roanoke.edu) to schedule an appointment. If you have registered with DSS in the past, and would like to receive academic accommodations for this semester, please contact Ms. Stephens-Forrest at your earliest convenience, to schedule an appointment. Please note that arrangements for extended time on exams, testing, and quizzes in a distraction-reduced environment must be made at least 48 hours before every exam.

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Target Course Schedule through Spring Break

Dates	Text Coverage – Mathematics for the Life Sciences
Jan 15 – Jan 26	Long Term dynamics and stability using equations and matrix models Chapter 6 Matrices Chapter 8 Transfer Matrices and Eigenvectors Chapter 9 Leslie Matrix Models and Eigenvalues
Monday, January 29	TEST 1
Jan 31 – Feb 12	Continuous Population Models (Unlimited and Limited Growth) Chapter 4 Exponential and Logarithmic Functions Chapter 17 Rate of Change Chapter 27 Differential Equation for one population Supplements Systems of Differential Equations - multiple populations
Wednesday, February 14	TEST 2
Feb 16 – Feb 26	Miscellaneous topics in BioMath Chapter 14 Hardy Weinberg Model for Population Genetics Supplements Cellular Automata Simulation Possibly others…
Wednesday, February 28	TEST 3
Friday, March 2	Modeling Portion of Course Project Due
Mar. 5-9	SPRING BREAK!