Math 115 - Quantitative Biology

Block 3 Fall 2018

Instructor: Prof. Jan Minton
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Office Hours: By appointment: Monday & Wednesday 3:30-4:30 and Tuesday & Thursday 2:30-4:30
Make appointments online at **jminton.youcanbook.me**

Course Objective: 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.

Understand the concept of 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.

Make a connection to mathematics and statistics present in selected biology research papers

Required Materials:
Textbook 1: *Mathematics for the Life Sciences*, Bodine, Lenhart, and Gross
Textbook 2: *Handbook of Biological Statistics,* McDonald
Free on-line at **http://www.biostathandbook.com/**
Supplemental Handouts
Inquire course management system available through MyRoanoke
Calculator (not on cellphone)

Attendance Policy: Full attendance is expected. Simple attendance is not graded, but there is good reason to predict that poor attendance will lead to lower grades overall. As stated in the Academic Catalog, "Every student is accountable for all work missed because of class absence. Instructors, however, are under no obligation to make special arrangements for students who are absent." Also, anytime you come in late or leave during class you miss part of the course and you disrupt the educational experience for everyone else. Do this only in the case of emergency.

Overall Workload: In addition to the 3 hours of class time, you are expected to work outside of class for a minimum of 9 additional hours per week.

Homework: Regular homework (assigned virtually every class period) will be a mix of practice problems and reading questions. It is important that you do this work in a timely fashion so that you can monitor your own progress and be prepared for the next class. This work will not be a direct part of the course average calculation but your effort will be recorded as responses collected through Inquire and used to make borderline decisions on final course grades.

Research Articles: Students will reflect on two Biology research papers. One paper 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.

Tests: There will be three in-class written mathematical modeling tests. Make-up tests will be given only under *very* extenuating circumstances that prohibit you from physically appearing in the classroom.

Case Studies: There will be seven case studies that will be explored using various computer applications. These will be conducted during class and take various forms – individual, partner, with notes/assistance and without notes/assistance. Students missing class on these days will be permitted to complete the work independently but such work will not be accepted for grading after grades have been posted for that assignment.

Term Project: There will be a semester-long group project that will include both mathematical modeling and statistical analysis of data. "Check Point" assignments will be made during the semester which will help students prepare for a comprehensive final presentation.

Final Exam: The final exam time for this course will be 8:30- 11:30 on Tuesday, December 11. This time will be used for the term project presentations and discussion.

Co-curricular Involvement: The Math, Computer Science and Physics 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. There is a link to the dates and times for these sessions on *Inquire*.

Members of this class are invited to attend all appropriate meetings; however participation in **at least one** of these sessions is mandatory. A response form is available on Inquire. Students must upload their completed forms at the link provided on Inquire. Failure to complete this requirement will result in a one-step lowering of the final grade (for example B to B-).

Academic Integrity And Electronic Devices: The college policy is fully supported. Expectations regarding permissible resources and individual versus group work will be clearly specified for each graded assignment.

The use of any unauthorized electronic device during completion of in-class graded work is strictly prohibited. Cell phones are never permitted. **<u>Any</u> use of a non-approved device while completing in-class graded work will be considered a breach of academic integrity.**

Grading: Weights for the various components of the course and final course letter grade assignments are given below:

Research Articles	10%	A 93-100	B- 80-82	D+ 67-69
Modeling Tests	30%	A- 90-92	C+ 77-79	D 63-66
Case Studies	35%	B+ 87-89	C 73-76	D- 60-62
Term Project	25%	B 83-86	C- 70-72	F below 60

IMPORTANT TO NOTE:

The Inquire gradebook will be used for grade STORAGE only. Inquire will not be used to calculate your official course average. Any averages you might see in Inquire for this course should not be trusted.

Material, content, and scheduling are subject to change if deemed appropriate or necessary by the instructor.

Math 115 Fall 2018

Dates of Special Interest this Semester

Daily Details/Assignments will be posted on Inquire

Friday, September 7	Case Study 1 – Statistical	
Friday, September 14	Case Study 2 – Modeling	
Friday, September 21	Modeling Test 1	Hardy Weinberg Equilibrium Model Transfer Matrix model of classification change
Friday, September 28	Case Study 3 – Statistical	
Friday, October 5	Case Study 4 – Modeling	
Friday October 12	Modeling Test 2	Leslie Matrix model for population structure Continuous models based on rate of change - Exponential growth and decay
October 15-19	FALL BREAK	
Wednesday, October 24	Modeling Research Article Reflection Due	
Friday, October 26	Case Study 5 – Statistical	
Friday, November 2	Modeling Test 3	Continuous models based on rate of change - Limited growth
Friday, November 9	Case Study 6 – Statistical	
Friday, November 16	Statistical Research Article Reflection Due	
Monday, November 19	Statistical Analysis Portion of Course Project Due	
November 21 & 23	THANKSGIVING HOLIDAY	
Monday, December 3	Case Study 7 – Number Sense	
Friday, December 7	Modeling Portion of Course Project Due	
Tuesday, December 11	Presentation of Course Project during Final Exam time 8:30-11:30	