# Syllabus for Mathematics 172, Section 002, Fall 2019

TIME AND PLACE: MWF 9:40am–10:30am, LeConte 101
INSTRUCTOR: Ralph Howard OFFICE: LC 304 PHONE: 777-7471
OFFICE HOURS: TTh 2:30pm – 3:30pm and by appointment
E-MAIL: howard@math.sc.edu
TEXT: *A Primer of Ecology* by Nicholas J. Gotelli, fourth edition. This is not required, but is highly recommenced as a supplement to the lectures.
CALCULATORS: You will need a graphing calculator that can to basic computations with matrices, such as a TI-83. The class demonstrations will be with the TI-83. There are several types of calculators that will do all that is required for the class and you are welcome to use them. However for calculators other than the TI-83 I may not be able to help with the programming.
CLASS WEB PAGE: This is where solutions to quizzes and tests will be posted.
http://ralphhoward.github.io/Classes/Spring2019/172/

**Tests:** There will be three midterms and a final. The midterms count for 100 points each and the final is 150 points. The dates of the tests are

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| Test 1 | Monday, September 23 |
| Test 2 | Monday, October 28 |
| Test 3 | Monday, November 25 |
| Final | Monday, December 9 at 9:00am |

**Homework and quizzes:** Homework will be assigned, but usually not collected. There will be daily quizzes based on the homework which will count for 100 points. ***Important note:*** The quiz total counts as much as a test so it is important that you show up and take the quizzes.

**Grading:** The there is a total of 550 points possible for the term broken down as follows:

| | |
|---|---|
| Three midterms @ 100 points each | 300 points |
| Total for Quizzes | 100 points |
| Final | 150 points |
| Total | 550 points |

Your grade will be based on the total out of 550. The last day to drop without a grade of WF is Monday, March 4 and you should have a good idea of where you stand by then.

**Prerequisites:** A grade of C or better in math 122 or math 141.

**There will not be make up exams or quizzes:** If you miss a test, then your score on that exam is 80% of the average of your other test scores including the final. If a second exam is messed the score on it is zero. Exams will be taken in class on the days listed above. So don't ask to take an exam early or late because you have to be "out of town" or some other reason. Likewise there will not be make up quizzes during the term. However the quizzes given during the last three class days are optional, and if taken can be used to make up missed quizzes or low scores. As a reward anyone who takes all the quizzes will get 10 extra points. Missing only one quiz is worth 5 extra points. On the other hand if someone leaves class early without permission then I reserve the right to give them a zero on quiz for the day.

**Sharing calculators on quizzes and tests is not allowed:** You should bring your calculator to every class meeting and especially to tests. If you do not bring it them you will not be allowed to share a calculator with someone else from the class on quizzes or tests and will thus lose the points on those questions that need a calculator. While cell phone have calculators built into them, use of cell phones, even as a calculator, during tests or quizzes is not allowed.

**About partial credit and bad algebra:** Some arithmetic errors do not bother me much. If your get in a hurry and get $7 \times 8 = 48$ it is not going to cost you much, provided you are doing everything else correctly. However, there are certain mistakes (all involving misuse of high school in such a way that always gives wrong answers), that will not be tolerated. If you make these mistakes I will mark the entire problem wrong. Here are some examples of zero point errors:

$$\sqrt{x+y} = \sqrt{x} + \sqrt{y}, \quad (x+y)^2 = x^2 + y^2$$

$$\frac{\log(2x)}{2} = \frac{\log(\not{2}x)}{\not{2}} = \log(x), \quad \frac{2x+3y}{3z} = \frac{2x+\not{3}y}{\not{3}z} = \frac{2x+y}{z}$$

This is not meant to scare you, but just to let you know where things stand.

**Getting help:** Besides my office hours you can get help in the Math Lab. This is a free tutoring service supplied by the mathematics department. An updated version of the schedule along with more information about the Math Lab is at

`https://sc.edu/study/colleges_schools/artsandsciences/mathematics/study/tutoring/`

**Course content:** Our goal is to use *mathematical models* to help understand population growth and related problem in biological systems. We start with example of models to get a feel for when a mathematical model is useful, how accurate it is, and if it is appropriate for understanding short term and long term predictions. The two basic types of models used are *difference equations* and *differential equations* and which is the one to use in a given setting. In some cases the long term behavior behavior (i.e. will it tend toward a fixed size, become extinct, or become chaotic) of a model can analyzed without solving them explicitly. In other cases the only way to deal with the is numerically with a calculator or a computer. A few of the population models we will look are unrestricted population growth, population growth with limited resources, population growth of predator systems, population growth of competing species along with several others.

**Learning Outcomes:** Upon successful completion of this course, students should be able to:

- Use mathematical models to help understand population growth and related problems in biological systems. Decide when a mathematical model is useful, how accurate it is, and if it is appropriate for understanding short term and long term predictions.
- Understand and utilize a variety of population models, including unrestricted population growth, population growth with limited resources, population growth of predator systems, population growth of competing species, and several others.

- Understand the concepts of and be able to solve problems drawn from biological modeling with differential and difference equations: techniques of model modification; analytic, numerical, and graphical solution methods; equilibria, stability, and long term system behavior; geometric series; vectors and matrices with applications to population dynamics.