Many of the topics we will cover in Biol 201 have a mathematical underpinning. In this section, we will use mathematics to understand the processes that we are covering in the lecture.

The goal of this section is to make a mathematical approach to these topics as accessible as possible. To accomplish that goal, we will use a number of techniques to remove some of the anxiety that many students experience when dealing with mathematical problems. This will include approaching problems using an intuitive approach, eliminating time constraints as much as possible, and encouraging lots of questions. The mathematical techniques we use will predominantly consist of algebra, but will also include some calculus and elementary probability. There will be plenty of opportunities for refreshers in class if you have forgotten some of these approaches!

The instructor reserves the right to make changes to the syllabus.

**Instructor:**

Dr. Maria Servedio  
Phone: 843-2692  
Office hours: Th 2-3, F 1-2, Wilson 234  
E-mail: servedio@email.unc.edu

**Grading:**

Your grade will be weighted more towards the section and less towards the exams given in the Biol 201 lecture.

<table>
<thead>
<tr>
<th>Item</th>
<th>Points</th>
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<tbody>
<tr>
<td>Biol 201: in class</td>
<td></td>
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<tr>
<td>Exam 1</td>
<td>25</td>
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<tr>
<td>Exam 2</td>
<td>25</td>
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<tr>
<td>Exam 3 (evolution)</td>
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<tr>
<td>Exam 3 (cumulative)</td>
<td>25</td>
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<tr>
<td>Biol 201H section – Homework</td>
<td>65</td>
</tr>
<tr>
<td>Group Project</td>
<td>35</td>
</tr>
<tr>
<td>Total:</td>
<td>200</td>
</tr>
</tbody>
</table>

**Homework:**

While in class on Fridays you will be using Mathematica to work on problems. These problems will be finished as homework assignments and will be due the following Tuesdays. I do not expect these assignments to take an inordinate amount of time.
You can get Mathematica for free for your own computer. To order Mathematica, go to the website http://software.unc.edu/ and click on “Student ordering” on the right hand side. Fill in the form (make sure to specify Mac or Windows), and they will contact you when your order is ready (they say 1-5 days at the beginning of the semester).

**Course Policies:**

Homework assignments are due on **Tuesdays** at class time (2pm) and the key for each assignment is posted the Friday after it is due (again at 2pm). Homework turned in by the end of the day on the due date will incur a 10% penalty on the final grade. Homework turned in from the start of Wednesday until the key is posted will incur a 20% penalty on the final grade. Homework assignments turned in after the key is posted can be accepted if the student does not look at the key, but incur a 50% penalty on the final grade.

Students assign an initial grade to their own homework assignment using the key, and can correct any error (explaining the logic of the correction) to earn back up to half of the missed points, at the discretion of the instructor. The initial grading of each assignment by the student is due on the Friday after that key is posted (1 week), at 2pm. Graded files turned in after that will not be eligible to earn back points from corrections.

**Honor code:**

Students are encouraged to work together on homework assignments, but must submit an independent write-up. Students are not allowed to use keys for the homework assignments from previous years. Violations of this policy will have honor code consequences.

**Group Projects:**

You will end the semester with a group project on a topic of your choice. Groups will consist of 3-4 students, and will be formed towards the end of February. Brief abstracts describing the topics for your projects will be due three weeks later.

Your group project will be presented in two ways, in 1) in class presentations during the last week of class, and 2) write-up presentations of your project. Your group presentations will be evaluated by myself and by the other class members.

In this course, you will be working with a Graduate Research Consultant (GRC), Sumit Dhole, who will assist you with the research project. You will meet with Mr. Dhole both before you turn in your abstracts and while working on the final project. The GRC Program is sponsored by the Office for Undergraduate Research (www.unc.edu/depts/our). We encourage you to visit this website to see other ways that you might engage in research, scholarship and creative performance while you are at Carolina.
Schedule:

Class meets on Tues 2-3 and Fri 2-3 in Wilson 202.

Jan 15, 18 – Introduction to Mathematica, Biological modeling and recursion equations.
Jan 22, 25 – Logistic growth – Equilibria
Jan 29, Feb 1 – Taylor series and stability, Eigenvalues
Feb 5, 8 – Host-parasitoid model – Matrices and systems of equations
Feb 12, 15 – Disease model & behavioral model
Feb 19, 22 – Leslie matrices
Feb 26, Mar 1 – Modeling natural selection
Mar 5, 8 – Natural selection at two loci – genotypes
Mar 19, 22 – Natural selection at two loci – alleles and Linkage Disequilibrium
Mar 26 – Modeling mutation and migration
Apr 2, 5 – Modeling sexual selection
Apr 9, 12 – Simulating genetic drift
Apr 16, 19 – Phase plane analysis, Project work day
Apr 23, 26 – Group projects – presentations

Group project – write-up due Apr 29