

MAT 357 Applied Mathematics I: Mathematical Modeling

Block 7 March-April 2018

Instructor: Professor Scott Jordan

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Office: Law Hall 204

Office Hours: By appointment.

Text: Mathematical Models in Biology by Leah Edelstein-Keshet, SIAM Classics in Applied Mathematics. ISBN: 978-0-898715-54-5. The text is not required for this class, but may some students may find it useful.

Class Meeting Times: There will be Lecture/Discussion on Monday, Wednesday, and Friday from 9 am to 12 pm and on Tuesdays and Thursdays from 9 am to 11 am. We will meet in Law Hall 221.

Prerequisite(s): MAT 236

Course Description from the Cornell Catalog: A course in applied mathematics. The material of this course is at the discretion of the instructor.

Course Description from the Professor: In this class we will learn about how to use discrete and differential equation to model physical systems. We will focus on learning about mathematical models in biology. We will learn methods to analyze both linear and non-linear systems. These methods include using phase-planes, stability, steady states, eigenvalues, eigenvectors, and nullclines. Models we will study, but are not limited to, the Nicholson-Bailey model, the Lotka-Volterra model, the Kermack-Mckendrick model, and Diffusion.

Course Objectives:

Upon completion of MAT 357 a successful student will be able to

- Solver a linear difference equation
- Analyze nonlinear difference equations
- Solve and analyze differential equations
- Model systems in biology: host-parasite, predator-prey, infectious disease, competition, diffusion
- Code a model in Octave

How to be successful in MAT 357:

Accept responsibility for your own learning.

Be prepared for class

Complete assignments on time.

Don't get behind. Complete assignments as soon as possible. Seek help as soon as you realize you need it.

Homework:

Homework is critical to your understanding of this course. Make sure that your homework is worth grading. Failure to follow the following homework submission format will result in the loss of points and may result in refusal of the submission entirely. Homework will be turned in during class. In order for your work to be considered for full credit it needs to meet the following criteria.

1. Homework needs to be stapled together in the top left corner.
2. The homework needs to be in order. The only exception is computer generated graphs. Those can be compiled at the end of the homework packet. They just need to be referenced in order in the homework section they belong in.
3. No frillies from spiral bound notebooks will be allowed. If there are, the homework will receive a zero.
4. Any homework pages that are not in the packet when turned in will not receive any points. This means that it is your responsibility to ensure that your homework contains all the required problems.
5. Homework problems are not to be put side by side in your work. All homework problems should go in order vertically. That means if I draw a horizontal line across the paper it should only cross one problem. Failure to do this will result in a zero.
6. Homework may be completed using Latex for 15% worth of extra credit points per homework packet.

LaTeX

LaTeX is a high-quality typesetting system; it includes features designed for the production of technical and scientific documentation. LaTeX is the de facto standard for the communication and publication of scientific documents. It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing. LaTeX is not a word processor! Instead, LaTeX encourages authors not to worry too much about the appearance of their documents but to concentrate on getting the right content.

To use LaTeX you will need a TeX distribution and a program to run it. They are both available for free. The website www.latex-project.org/get/ provides information on how to obtain a TeX distribution. This distribution will come with a program that you can use. I personally use texmaker. It is available for free at <http://www.xm1math.net/texmaker/>. If you have any questions on how to get LaTeX on your computer, please let me know.

Octave

We will be using Octave throughout this course to code the mathematical models we learn. It is a similar program to Matlab, but it is free! The link to the website where you can download the program is <https://www.gnu.org/software/octave/>. The link can also be found in the course Moodle page. In this course we will only use Octave to code our models. I do that so you have enough time to become familiar with the program so that you can put that you know how to code in Octave on your resumes.

Paper Presentations

In this class we will be doing presentations on various papers that have been published. The end goal of this is to give you experience on learning how to read and understand mathematical articles. We will have several opportunities to present on these papers in groups. It is far more effective to read these papers as a group so that you have someone to talk to the paper about. We will choose groups during the first week and those will be the groups for the rest of the block. Presentations on these papers can be in whatever form the group decides is best. This can range from walking through ideas on the board to presentation slides.

Labs and Projects

We will be doing several labs and projects in this class as groups. The labs/projects are hands on labs that will give you the chance to collect data, fit a model to the data, run simulations, and then compare those simulated values to the data.

Grade Distribution:

Homework	50%
Labs/Projects	30%
Paper Presentations	20%

Letter Grade Distribution:

Range	Letter	Range	Letter
≥ 93.00	A	73.00 - 76.99	C
90.00 - 92.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	≤ 59.99	F

I reserve the right to adjust this grade distribution as needed.

Course Policies:

- **Changes in the syllabus**

I reserve the right to make changes to any part of this syllabus. Changes will be announced in class and through class wide email. If changes are made, a revised syllabus will be posted in Moodle.

- **Communication and availability**

I am available most of the day. I leave my office sometime between 4-5 pm. I may be available to answer emails between 9-10 pm. If you email me after that time, don't expect a response till the next day.

- **Distractions**

Other than our classroom computer, no electronic devices may be used in our classroom while class is in session. Exceptions will be made in special cases, for example if these are used in an accommodation for a disability.

- **Drop**

I follow the college's policy on 15th day drops; i.e. in order to be eligible for a third Friday drop, you must attend every class meeting and complete all course work.

- **Academic Integrity**

Cornell College expects all members of the Cornell community to act with academic integrity. An important aspect of academic integrity is respecting the work of others. A student is expected to explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a piece of work is submitted for credit, a student is asserting that the submission is her or his work unless there is a citation of a specific source. If there is no appropriate acknowledgement of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Catalogue, under the heading "Academic Honesty."

- **Accommodations**

Cornell College makes reasonable accommodations for persons with disabilities. Students should notify the Coordinator of Academic Support and Advising and their course instructor of any disability related accommodations within the first three days of the term for which the accommodations are required, due to the fast pace of the block format. For more information on the documentation required to establish the need for accommodations and the process of requesting the accommodations, see <http://www.cornellcollege.edu/academic-support-and-advising/disabilities/index.shtml>.