Math 6780
The Mathematics of Biological Regulation

Time: Tuesday, Thursday 10:45 a.m. - 12:05 p.m.
Place: GC 5680
Instructor: Fred Adler
Offices: 304 LCB
Phones: 1-6848 or 5-6202
email: adler@math.utah.edu
Web page: We’re be on Canvas!
Office Hours: TBA

The Course: The central question in ecology is “what regulates populations?” Cancer is the breakdown of the regulation within and between cells. Autoimmune disease is the failure of the immune system to regulate its response. As the study of feedbacks and their consequences, mathematical modeling provides the tools to understand and unify mechanisms of regulation in these and many other systems across the full range of biology.

There are no formal prerequisites, but knowledge of mathematical biology at the level of Math 5110-5120 will help. No knowledge of statistics or ecology is needed. Let me know if you have questions!

Class Meetings: We are scheduled to meet in person and I’ll have Zoom available when in-person meeting is not possible. I’ll set up a Zoom meeting for both class and office hours.

Learning objectives: Engage with the many steps of mathematical modeling. At the end of the course, the student will be able to:

1. Frame a question that can be answered
2. Develop mathematical models
3. Check results on the computer
4. Collaborate with those with complementary skills
5. Present results in both speech and writing
6. Link across different mathematical and biological disciplines.

Readings: We will have readings from the research literature posted regularly on Canvas. Students should read assigned materials in advance of class and be prepared to discuss them.

Homework: There will be written homework now and then, with some of the problems being more open-ended explorations of extensions of the ideas discussed in class. Using a computer will likely be necessary.

Tests: Unless there is vociferous demand, there won’t be any tests.
Projects: By the beginning of February, I’d like to meet with each student to discuss a project building on something from class or a potential research topic. Each student will share teaching with me on one day toward the end of the semester, and hand in a write-up by May 4.

Grading: The grade will be based approximately 20% from homework, 20% from journals, 40% from the project, and 20% from classroom participation and leadership. Shy students can make this up by completing more open-ended questions mentioned in class. The journal should describe ideas related to the course, including successes, failures, questions, inspirations, connections to the rest of your life and so forth. Journals will also include a one-page response to any assigned readings, with a half-page summary of the key points of the article and a half-page reflection to challenge or extend the ideas, with reminders and instructions posted on Canvas. Journals will be handed in at around the beginning of each month (Feb 2, March 2, April 6, and May 4) on Wednesdays, with comments returned by the following Monday.

Course outline: This rough outline will likely change based on how things go, but it would be good to make contact with each of the big topics. I will post any readings on Canvas, hand them out, or tell you not to bother.

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<thead>
<tr>
<th>Month</th>
<th>Topic</th>
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<tbody>
<tr>
<td>January</td>
<td>Population regulation in ecology</td>
</tr>
<tr>
<td>February</td>
<td>Regulation in systems of cells</td>
</tr>
<tr>
<td>March</td>
<td>Regulation within cells</td>
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<tr>
<td>April</td>
<td>Role of regulatory mechanisms in societies</td>
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Canvas: Readings, announcements, and discussions will be hosted on Canvas, so please check the site frequently, and at a minimum at least once a few hours before each class.
COVID stuff: For Spring 2022, Math 6780 will be meeting in person for most of the semester. In order to protect everyone from COVID-19, masks will be required (except for those with approved accommodations for disabilities), and social distancing will be enforced. Changes in the COVID-19 situation may cause the course to move online at other times. In order to participate in the online components of the course, you will need to have access to a computer and a broadband internet connection. You will also need to be able to use Canvas, Zoom and other online resources effectively. Laptops are available for checkout from the Marriot Library for the semester, depending on availability: https://lib.utah.edu/coronavirus/checkout-equipment.php If you have concerns about any of these requirements, please contact the instructor as soon as possible.

Current information about the university’s response to to COVID-19 can be found at:
https://coronavirus.utah.edu/
https://returntocampus.utah.edu/
https://coronavirus.utah.edu/checklists/#student-checklist

In order to help monitor the spread of COVID-19 and respond appropriately, the university requires that all students complete a reporting form if they have been exposed to, are being tested for, or have been diagnosed with COVID-19 at https://coronavirus.utah.edu/reporting

Attendance: Because much of the course material will be developed as a group in class, attendance is essential when possible, and class participation is portion of the grade. All materials developed during in-class meetings will be made available after the class, including computer programs. If we need to go online, we’ll move to Zoom, and we’ll go hybrid if students are forced to quarantine. Adjustments to allow non-attendance can only be granted in collaboration with the Center for Disability and Access (CDA). CDA will work with us to determine a fair and effective strategy.

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Academic Conduct In order to ensure that the highest standards of academic conduct are promoted and supported at the University, students must adhere to generally accepted standards of academic honesty. Acts of academic misconduct include cheating, plagiarizing, research misconduct, misrepresenting one’s work, and inappropriately collaborating. Suspected cases of academic misconduct will be dealt with according to the procedures found in the Student Code, University Policy 6-400(V) http://regulations.utah.edu/academics/6-400.php. Instances of academic misconduct will be recorded in a database that may be made available to other University of Utah Departments and Colleges.

ADA statement: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.
**Accommodations policy:** The instructor does not grant content accommodation requests as the course content fulfills legitimate pedagogical goals.

**Classroom etiquette:** Students will maintain a respectful and safe learning atmosphere, and class will be canceled if this atmosphere is violated. We honor use of preferred pronouns, embrace a diversity of perspectives and backgrounds, and encourage constructive debate about all topics related to the course.

**Sources of Support:** Assistance for students with challenges related to immigration status is available through the Dream Center, for those with personal or health concerns through Center for Student Wellness, for veterans through the Veterans Support Center.

**Legalistic Language:** This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you, and I am open to suggestions to improve any aspect of the course. Any changes will be announced in class and posted on Canvas under Announcements.