MATHEMATICS 4800

MATHEMATICS REU COURSE

THE MATHEMATICS OF DISEASE

Time and Place: TH 2:00 PM-3:20 PM , LCB 222
Instructor: Fred Adler
Offices: 304 LCB and 319 South Biology
Office Hour: TBA
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Background texts:

Roy Anderson and Robert May
Infectious Diseases of Humans: Dynamics and Control
Matt J. Keeling and Pejman Rohani
Modeling Infectious Diseases in Humans and Animals
Sarah P. Otto and Troy Day
A Biologist's Guide to Mathematical Modeling
Lauren Sompayrac
How the Immune System Works

The Course. Research is very different from classroom learning. Asking the right question is usually much more difficult than solving even the trickiest homework problem. Based on examples from infectious disease, we will together experience the three stages of research in mathematical biology:

- Framing the question
- Using mathematical and computational methods to come up with an answer, which often involves modifying the question
- Presenting results so that others can understand them.

As Einstein said, "If we knew what it was we were doing, it would not be called research." As I like to say of music, "if the band stops playing, the music stops." The same is true of research. As soon as you stop working and experimenting, the research grinds to a halt.

Learning objectives. Our goal is to learn how the research process works. Students will learn 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.

Deliverables. There will be no formal homework. Students will keep a journal describing what they have been thinking about related to the course, including successes, failures, questions, inspirations, connections to the rest of their lives and so forth. Journals will be handed in every two weeks (on Tuesdays starting on the third week of class or September 4) and returned on Thursday. Final journals will be due on December 10. During the last two weeks of the semester, each student or group will present results, and a paper write-up on each topic will be due on December 10.

Projects. We will begin with three smaller research questions, each taking about two weeks and to be addressed as a group. We will then spend a full week discussing ideas for larger research projects that will take up the second half of the course. Depending on how these ideas develop, students can work individually or in groups. During this time, class meetings will include updates on research, presentation of background information on biology, mathematics and research as need arises, and guided research.

Grading. Grades will be weighted according to the following scheme.

Journal	30%
Class participation	30%
Final project write-up	30%
Final project presentation	10%

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.

Accomodations 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 cancelled if this atmosphere is violated.

COURSE OUTLINE

Week	Dates	Topic
1-2	Aug 21-30	Why aren't we all dead?
3-4	Sept 4-13	HIV latency
5-6	Sept 18-27	Randomness in epidemics
7	Oct 2-4	Project idea discussion
8-10	Oct 15 - Nov 1	Project research, background topics
11	Nov 6-8	Project progress reports
12-13	Nov 13-20	Project research, background topics
14-15	Nov 27 - Dec 6	Project presentations
	Dec 10	Write-ups and journals due

Journals will be handed in on Sept 4, Sept 18, Oct 2, Oct 23, Nov 6, Nov 20, and at the end of the semester on Dec 10. Aim for about two pages per week, which can include writing, drawings, calculations or pictures, and try to synthesize material and make connections.