

## ADVANCED STATISTICAL MODELING FOR BIOLOGISTS

Time and Place: TH 10:45 AM-12:05 PM , LCB 222  
Instructor: Fred Adler  
Offices: 304 LCB and 319 South Biology  
Office Hour: TBA  
Phones: 1-6848 or 5-6202  
email: adler@math.utah.edu  
Web: <http://www.math.utah.edu/~adler/bio6500/>  
Text: Ecological Models and Data in R, Ben Bolker

or

Statistics: An Introduction Using R, Michael J. Crawley

Supplementary texts:

J. Adler, *R in a Nutshell*

J. S. Clark, *Models for Ecological Data*

R. Hilborn and M. Mangel, *The Ecological Detective*

S. Otto and T. Day, *A Biologists Guide to Mathematical Modeling*

**The Course.** Advanced statistical modeling for biologists is designed for life science graduate students with a perhaps rusty background in mathematics and statistics who wish to become real practitioners of the art of modern statistics. The course will be based on the R programming language, and have the following elements:

- Introduction to the R language
- Simulating experiments in R
- Analyzing time-to-event data
- General linear models
- Contingency tables

Throughout, the focus will be on the tight link between experimental design, explicit model building, and statistical analysis.

**Homework.** Homework will be project-based, involving each of the main components of the course, roughly every 2-3 weeks.

**Projects.** The project is central to the course, and involves choosing a topic, and presenting the idea, a progress report, and a full poster (or talk) at the end of the semester, along with a formal write-up. These projects should be based on the students own area of research or area of research interest, and involve analysis of real or simulated data. During the fifth and sixth weeks of the semester, I'll meet with each registered student to discuss this project.

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

Written homework	20%
Project presentation	20%
Project write-up	40%
Class participation	20%

**Learning Objectives** The goal of this course is to give graduate students the tools they need to work with complex data sets. Rather than seeing statistics as a grab bag of techniques, the focus will be on the tight link between experimental design, explicit model building, and statistical analysis. Students will

1. Learn to use the R language,
2. Learn to simulate experiments in R,
3. Learn to analyze time-to-event data, general linear models and contingency tables,
4. Gain experience with likelihood and modern model fitting techniques.
5. Creatively analyze your own data

**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 cancelled if this atmosphere is violated.

## COURSE OUTLINE

Week	Date	Topic
1	Aug 21	Introduction to probability, statistics, and R
2	Aug 28	Simulating time to event data
3-4	Sept 3	Analyzing time to event data
5	Sept 17	Simulating data from a multifactorial experiment
6	Sept 24	Analyzing data from multifactorial experiments
7	Oct 2	Project idea presentations
8	Oct 16	Simulating data from a contingency table experiment
9-10	Oct 23	Analyzing data from a contingency table experiment
11	Nov 6	Project progress reports
12-13	Nov 12	Special topics, project work
14-15	Nov 26	Project presentations