

COURSE TITLE: Introduction to Mixed Effects Models
COURSE NUMBER: Biol-864
TERM OFFERD: 2161 Winter 2016
INSTRUCTOR: Chris Eckert
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OUTLINE OF TOPICS:

This is a course designed to introduce students to the use of mixed effects models with application using real biological data. Each student will bring a laptop to class. Half of each 90 minute session will consist of a lecture by the faculty instructor, followed by a student presentation of homework, and a hands-on interactive session using the statistical program, R.

METHOD OF INSTRUCTION:

Students taking this course will develop advanced skills in using R for analyzing and graphing biological data. Specifically, students will learn advanced techniques for analysing data when there is a mixture of fixed and random effects. Emphasis will be placed on when and how to include random effects in statistical models as well as a practical understanding of the underlying statistical theory.

Sessions (12 sessions)

Lecture topics:

1. Why biological data usually violates the assumptions of linear models
2. Fixed versus random effects in biology
3. The wrong and the right approach to random effects
4. A simple starting point: the randomized blocked design
5. Evaluating significance using likelihood ratio tests
6. More sophisticated approaches to model selection
7. Partitioning random variance in nested designs
8. Repeated-measures designs
9. More repeated-measures designs
10. Complex, partially hierarchical analyses
11. Simulation-based tests of significance
12. Using MCMC to evaluate models

Session Structure (45 minutes lecture, 45 workshop):

Workshops would consist of student presentation of homework assignments and practical experience applying statistical techniques in R. A typical session will involve a 45 minute lecture by the faculty instructor, followed by a student presentation of the assigned homework, and a group-learning exercise to analyze data using the statistical program, R.

EVALUATION:

Homework presentation: 25%
Participation: 15%
Homework assignments: 60% (5% each)

RECOMMENDED TEXT AND REFERENCE MATERIAL:

Zuur AF, EN Ieno, NJ Walker, AA Saveliev, GM Smith. 2009, Mixed effects models and extensions in ecology with R. Springer, New York.

PREREQUISITE AND ASSUMED BACKGROUND:

None

EXCLUSIONS:

Biol-843

ENROLMENT:

Limited to 12 students