

Biostatistics EEB 411

Instructor:

Instructor: James Fordyce (4-2925) jfordyce@utk.edu
Office: 540 Hesler Hall
Office hours: Monday following class or by appointment
MWF 10:10-11:00 (104 STRONG)

TA: Liam Mueller lmuelle3@vols.utk.edu (office hours: Lets decide in class, or by appointment – 790 Dabney)

Communication: Canvas. Supplemental reading and assignments will be posted there.

Text: Crawley, M.J. 2012. The R Book. Wiley (this is free through the utk library site)

Course Objectives: The use of statistics is ubiquitous in the fields of ecology and evolution. An understanding of statistics is not only important for the design of experiments and analysis of one's own data, but also for the ability to critically read the literature (including literature that you might be asked to review). It is important for scientists to understand *what* various statistical approaches are doing and exactly what hypotheses are being tested, rather than simply focusing on 'significance'. The goal of this course is to introduce basic statistical approaches in a way that we might understand what statistical hypothesis is being addressed and how we might interpret this biologically. No course (certainly not this one) can cover the whole body of statistical approaches used by researchers. One objective of this course is for you to feel comfortable with the language of statistics so that you can use books or consultants efficiently. Another objective of the course is to encourage (strongly) carefully thinking about the design of a study – from idea, to question, to hypothesis, to experimental design, to analysis, to (finally) interpretation of analysis. In a perfect world (and we all want a perfect world) all these steps should be done before the first datum is collected. One should never collect data and then ask, "How should I analyze this?". In this course we will cover basic probability, the use of distributions for hypothesis testing, and linear models. We will also explore some of the multivariate analyses that are frequently used in the fields of ecology and evolutionary biology. Have fun – stats are fun.

Assessment:

Weekly Exercises 60% - 11 total, lowest score will be dropped
Mid-term 20% - March 2-5 (It's part take home, part in class)
Final 20% - May 7 (08:00-10:00)

The assignments will consist of analyses and description (including figures, etc. if necessary) of experimental data provided. Documents should be emailed to <eebbiostatistics@gmail.com>.

Software:

We will be using the statistical programming language, R.
R is free at <http://www.r-project.org/>. R has become a standard tool in ecology and evolutionary biology (look through a recent issue of Evolution or Ecology and you'll notice R is commonly used). R also has great graphics abilities. We will like R. We will like it very much.

Exercises will largely consist of annotated computer code. The code should be emailed to me at <eebbiostatistics@gmail.com> by 10:10 am the day they are due.

Tentative Schedule

10-Jan	Introduction
12-Jan	Types of data / Intro R
17-Jan	Intro R
19-Jan	Distributions / Probability
22-Jan	Distributions / Probability
24-Jan	Distributions / Probability
26-Jan	Conditional Probability & Bayes' theorem
29-Jan	Distributions / Probability
31-Jan	Location and spread
2-Feb	Summary Statistics
5-Feb	Moments and transformations
7-Feb	Bivariate relationships
9-Feb	Correlation and null hypothesis testing
12-Feb	Power
14-Feb	Linear models / regression
16-Feb	Linear models / regression
19-Feb	Linear models / regression
21-Feb	Multiple regression
23-Feb	Multiple regression*
26-Feb	Multiple regression
28-Feb	Multiple regression
2-Mar	Exam
5-Mar	Take home-MIDTERM
7-Mar	Comparing groups
9-Mar	Comparing variances
12-Mar	<i>Spring break</i>
14-Mar	<i>Spring break</i>
16-Mar	<i>Spring break</i>
19-Mar	Multiple group comparisons
21-Mar	ANOVA
23-Mar	ANOVA
26-Mar	ANCOVA
28-Mar	Experimental design
30-Mar	*****No class*****
2-April	Mixed models
4-April	Mixed models
6-April	Mixed models
9-April	Categorical data
11-April	GLM
13-April	GLM
16-April	GLM
18-April	ORDINATION
20-April	ORDINATION
23-April	ORDINATION
25-April	ORDINATION
27-April	Final review
7-May	Final exam (08:00 to 10:00)