

## Advanced Studies in Biostatistics

INSTRUCTOR:	Steven Juliano	OFFICE:	335 FSA	PHONE:	309 438-82642
E-MAIL:	<a href="mailto:sajulian@ilstu.edu">sajulian@ilstu.edu</a>	HOURS:	by appointment		
WEB:	<a href="http://www.bio.ilstu.edu/juliano/juliano%20courses.htm">http://www.bio.ilstu.edu/juliano/juliano%20courses.htm</a>				
LECTURE:	T 9:00 –10:50AM; F 1:00 -2:50PM	LOCATION:	SLB 121		

**Course content:** Advanced Studies in Biostatistics is designed to give graduate students the opportunity to learn some advanced statistical techniques now used by biologists, primarily in ecology, behavior, physiology, and evolutionary biology. The **prerequisite** for this course is **BSC 490/420.27** (Biostatistics and Biostatistics Laboratory), or an equivalent graduate level course in applied statistics. If you have had a course that you think is the equivalent, you should discuss this with me immediately. A working knowledge of the statistical package *SAS 9* is **desirable**. You should be able to operate IBM compatible computers in Windows, and to use Excel.

I intend to be flexible in my approach to the breadth and depth of the material covered. The emphasis of the course is on statistical applications - that is how to apply particular procedures to specific problems. We will only cover statistical theory to the extent necessary to understanding the applications. I plan to offer lectures describing the particular problems and situations for which the advanced techniques described can be used, and to explain the interpretation of results from these advanced techniques. Much of the actual learning of the techniques will occur when you use them in problems that I will assign (and, actually, by working through examples, whether they are formal assignments or not). How much you learn depends primarily on you, and on the effort you are willing to give.

**Required Text:** Scheiner, S. M. & Gurevitch, J. (eds.) 2001. *Design and Analysis of Ecological Experiments*, 2<sup>nd</sup> edition. Oxford University Press, Oxford

This text includes 18 chapters on various advanced techniques used primarily in the field of ecology, and primarily in experimental (as opposed to observational) analysis. Although the text emphasizes ecological applications, all of the techniques described are applicable to other subdisciplines of biology, and in fact to disciplines beyond biology. I plan to cover most of the chapters in the book, though the detail with which they are covered will vary.

This book includes supplementary material (data sets, SAS code) as html files on Oxford University Press web site. We will make use of this material, so you should bookmark the site:

<http://www.oup-usa.org/sc/0195131886/index.html>

These files can also be downloaded as zipped files. Some of these files contain errors. I will point them out when I can, but we may find some new ones.

There will also be a **Blackboard web site** for this course. Details will be given in class.

Supplemental assignments on randomization methods will come from another book (not required):

Manly, B. F. J. 1991. *Randomization and Monte Carlo Methods in Biology*. Chapman & Hall, New York.

**Grade:** There will be no exams. Your grade in this course will be based on graded assignments, which will consist of statistical problems for you to analyze. For each problem, you will apply the techniques described, and write a report on the results. The reports will be graded based on correct execution and interpretation of the procedures, and clear presentation of the results. **Reports must be turned in electronically (as an email attachment) and will not be accepted late.** For each problem, I will include a set of questions that will help you in the writing of the report. Reports should include publication-quality graphics and tables. **Relevant statistical input and output should be included as an appendix.**

### Topic Outline

*(Instructor reserves the right to modify this outline any time he feels like it)*

Topic	Reading Assignment
<b><u>PART 1: Introduction</u></b>	
Using statistics in science .....	Scheiner & Gurevitch Ch. 1
Graphical presentations & Exploratory data analysis ...	Scheiner & Gurevitch Ch. 3
<b><u>PART 2: ANOVA &amp; MANOVA</u></b>	
Experimental design .....	Supplementary readings
Laboratory experiments .....	Scheiner & Gurevitch Ch. 4
Field experiments .....	Scheiner & Gurevitch Ch. 5
Multivariate Analysis of Variance .....	Scheiner & Gurevitch Ch. 6, 8
Power analysis .....	Scheiner & Gurevitch Ch. 2
<b><u>PART 3: Regression &amp; Correlation</u></b>	
Nonlinear regression .....	Scheiner & Gurevitch Ch. 10
Path analysis .....	Scheiner & Gurevitch Ch. 12
Time series analysis .....	Scheiner & Gurevitch Ch. 9
Logistic regression .....	Scheiner & Gurevitch Ch. 11
<b><u>PART 4. Randomization Tests</u></b>	
Basic concepts .....	Manly Ch. 1, 2, 3
Bootstrap & Jackknife .....	Scheiner & Gurevitch Ch. 14
Randomization ANOVA & ANCOVA .....	Scheiner & Gurevitch Ch. 7, Manly Ch. 5
<b><u>PART 5. Miscellaneous Tests</u></b>	
Failure time analysis .....	Scheiner & Gurevitch Ch. 13
Spatial analysis: Mantel's test .....	Scheiner & Gurevitch Ch. 16
Meta-analysis .....	Scheiner & Gurevitch Ch. 18