

Syllabus – Biostatistics, ZOOL 557, Fall 2004

Instructor: John D. Reeve, Dept. of Zoology, Life Science II, Room 355F, (618) 453-6670, jreeve@zoology.siu.edu. Office hours TBA.

Time: Lectures are MWF 10-10:50 am, Life Science II, Room 450. There is also a discussion section on F 12-12:50 pm, Life Science II, Room 430. The discussion will be used for questions on the lecture material, software demos, and to discuss assigned readings from the ecological literature.

Text: (1) Sokal, R. R. and F. J. Rohlf. 1995. *Biometry: the Principles and Practice of Statistics in Biological Research*. W. H. Freeman and Co., New York, NY. (2) Rohlf, F. J. and R. R. Sokal. 1995. *Statistical Tables*. W. H. Freeman and Co., New York, NY. Copies of the lecture notes will also be provided at the beginning of each class. In addition, various readings from the ecological literature will be assigned for discussion. These will be made available in the Zoology Department grad student mail room.

Software: SAS for Windows, Version 9.1. SAS is the most commonly used statistical software in education, government, and industry. It is available at SIU through a site license and can be leased for either departmental or personal use for \$65. The lease period is one year, after which the software will cease running unless the lease is renewed. Many of you will have access to SAS through your graduate advisors. If you are interested in leasing SAS yourself, please complete the attached lease form and return it to Pamela Reed, Wham Educational Building 0B15. She will then provide you with the installation disks. While the software contains a help system, most of the SAS documentation is found in the SAS OnlineDoc system (<http://sasdocs.siu.edu/>). This system can only be accessed through the SIU network – you must use a computer on campus OR have a dial-up connection through SIU.

Assignments and Grading: The overall grade will be based on 300 total points, divided among five problem sets (30 points each, 150 total), a midterm (50 points) and a final (100 points). The midterm and a portion of the final are given in class. Grades are determined on a percentage basis (90-100% A, 80-90% B, 70-80% C, etc.). The material in the discussion readings is always included in the exams. Students are allowed to discuss the problem sets, and ask me questions about them, but each student must submit their own work (no copying).

Topics to be Covered

Introduction, Data in Biology

S & R chapters: 1-3

SAS Help: Getting Started with SAS (see class demo)

Discussion: no readings, overall SAS Demo

Descriptive Statistics

S & R chapters: 4

SAS OnlineDoc: Base SAS - SAS Procedures Guide – The PRINT Procedure, The UNIVARIATE Procedure (see class demo for <http://sasdocs.siu.edu/>)

Discussion: no readings, Q & A

Assign Problem Set 1

Probability and Random Variables

S & R chapters: 5

SAS Online Doc: none

Discussion: no readings, Q & A

Normal Distribution, Expectation, Central Limit Theorem

S & R chapters: 6, 7

SAS Online Doc: none

Discussion: no readings, Q & A

Parameter Estimation, Hypothesis Testing

S & R chapters: 7

SAS Online Doc: Base SAS - SAS Procedures Guide - The UNIVARIATE Procedure

Discussion: Magnusson 1991

Assign Problem Set 2.

One-Way ANOVA

S & R chapters: 8, 9

SAS Online Doc: SAS/GRAPH – SAS/GRAPH Software: Reference – The GPLOT Procedure

SAS Online Doc: SAS/STAT – SAS/STAT User's Guide – Introduction to Analysis of Variance Procedures, The GLM Procedure, The MIXED Procedure

Discussion: Yoccoz 1991

Midterm

Nested ANOVA

S & R chapters: 10

SAS Online Doc: SAS/STAT – SAS/STAT User's Guide – The MIXED Procedure

Discussion: no readings, Q & A.

Assign Problem Set 3.

Two-Way ANOVA

S & R chapters: 11

SAS Online Doc: SAS/STAT – SAS/STAT User’s Guide – The GLM Procedure, The MIXED Procedure

Discussion: Bennington & Thayne 1994

Three-Way ANOVA

S & R chapters: 12

SAS Online Doc: SAS/STAT – SAS/STAT User’s Guide – The GLM Procedure

Discussion: Potvin 1993

Assign Problem Set 4.

Assumptions of ANOVA

S & R chapters: 13

SAS Online Doc: SAS/STAT – SAS/STAT User’s Guide – Introduction to Nonparametric Analysis, The NPAR1WAY Procedure

Discussion: Hurlbert 1984

Linear Regression and ANCOVA

S & R chapters: 14

SAS Online Doc: SAS/STAT – SAS/STAT User’s Guide – Introduction to Regression Procedures, The REG Procedure, The GLM Procedure

Discussion: no readings, Q & A

Assign Problem Set 5

Review for Final

Bibliography of Discussion Readings

Bennington, C. C. & Thayne, W. V. 1994. Use and misuse of mixed model analysis of variance in ecological studies. *Ecology* 75: 717-722.

Hurlbert, S. H. 1984. Pseudoreplication and the design of ecological field experiments. *Ecological Monographs* 54: 187-211.

Magnusson, W. E. 2000. Error bars: are they the king’s cloths? *Bulletin of the Ecological Society of America* 81: 183-184.

Potvin, C. 1993. ANOVA: experiments in controlled environments. Pages 46-68 in *Design and Analysis of Ecological Experiments*, S. M. Scheiner and J. Gurevitch eds. Chapman & Hall, New York, NY.

Yoccoz, N. G. 1991. Use, overuse, and misuse of significance tests in evolutionary biology and ecology. *Bulletin of the Ecological Society of America* 72: 106-111.