

Biometry- Biology 345

Fall 2005 – Sonoma State University

Instructor: Dr. Nathan Rank
Office: Schulz 2009C
Office Hours: Tuesday & Wednesday 2:30-4:00
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Lecture: 1:00 – 2:15, Tues & Thurs, 700B
Laboratory: 2:25 – 5:15, Thurs, 700B
Prerequisites: Biology 121, 122, 123, Mathematics 165

Required Texts: Quinn, G.P. and M.J. Keough. 2002. *Experimental design and data analysis for biologists*. Cambridge University Press, New York, NY
Sall, J., A. Lehman and L. Creighton. 2005. *JMP Start Statistics*. A guide to statistics and data analysis using JMP and JMPIN software. SAS Institute. Thomson Brooks/Cole, Belmont CA.

Objectives: In this course, you will be introduced to principles of experimental design, methods of data collection, exploratory data analysis, and statistical tools used by biologists to analyze data. My goal is to help you gain familiarity with statistical analyses used in biology. You should be able to develop a sampling strategy, design experiments, collect and interpret data, and present results consistent with current scientific practice. You should also be able to critique data analyses conducted by others and identify problems in a statistical analysis that you find in the scientific literature.

Relationship to other courses: You should have experience with statistics before you enroll in this course. Math 165 (Introductory Statistics), or an equivalent course from another university, is a prerequisite for the course. This course may be used to fulfill the Ecology and Evolution core area requirement for an undergraduate biology major, but you can also fulfill this requirement by taking Ecology, Evolution, or Marine Ecology. You should be particularly interested in this class if your career path emphasizes scientific research in ecology, evolution, physiology, or biomedicine.

Assigned readings: The lecture syllabus lists text chapters that must be read for each class. Students will also receive handouts for each laboratory exercise. In both cases, students are expected to complete assigned readings BEFORE coming to lecture/lab.

Additional sources: A valuable source of information about statistical principles and data analysis is your JMPIN manual. This volume provides information for how to perform analyses or data summaries in JMP, and it explains statistical principles in a different way than your text. In addition, you will find that texts such as *Biostatistical analysis*, by J.H. Zar, or *Biometry*, by Sokal and Rohlf, provide valuable information about statistical methods not described in your text. These texts also include statistical tables and show how to perform statistical tests manually.

Office Hours: I encourage you to visit my office hours to discuss course content or for assistance to complete course assignments. I also like to consult students in small groups. I can make appointments outside scheduled office hour periods if necessary, but I may not have time for you if you drop in outside a scheduled appointment.

Participation: I expect you to attend all lectures and laboratories. Laboratories will focus on learning the JMP program and using it with data sets provided by me to learn statistical principles. There will be no laboratory make ups, but you can fulfill the assignment even if you miss the laboratory session. I will focus on lecture material for examinations and assignments.

Assignments:

- 1) Examinations: There will be three mid-term exams and one final exam, each worth 100 points. Each exam will include an in-class portion (30 pts) and a take home portion (70 pts). You will submit the take-home portion to me at the beginning of lecture following the exam. Exams will be given on Thursdays and returned to me on the following Tuesday. You may use published sources (statistics texts, software manuals, Web pages) to help you complete your exams, but you must complete the exam alone, without the assistance of other students or consultants. I will expect you to show your work and express yourself in sufficient detail to demonstrate that you completed the exam without assistance. The final examination will be a 100 point cumulative, take home examination. No make-up exams will be given without a well-documented excuse (e.g. signed note from doctor or death in the family). If you could not make it to an exam because of a legitimate emergency, notify me in advance. I cannot accommodate requests for make up exams based on conflicts with travel plans.
- 2) Laboratory exercises: During the semester, I will distribute 10 laboratory exercises, which you will work on during the laboratory and submit the following week (due dates shown on syllabus). Each exercise is worth 10 points. You should try to complete as much of the exercise during the laboratory as possible, and count on spending the entire 3 hr laboratory period in class. During the laboratory, you may consult with other students (and me) about the analyses, but you must complete the written part of the exercise without assistance from others. Each exercise will emphasize hypothesis testing and interpretation of your data analysis.
- 3) Lab participation: You are expected to come to laboratory and participate actively throughout each exercise. Students who do this well will receive credit for attendance and participation. I will deduct points for rushing through the exercise and not completing written work.
- 4) Project analysis: You will complete a statistical analysis of a biological data set. You may use a data set that you have generated during your undergraduate or graduate research, but you may not use a data set that you collected as a group or individual project in another SSU course. You may use data collected under supervision of another professor as part of your independent research. However, for the purposes of this project, I may expect you to use a statistical approach, based on material presented in this course, which differs from the approach you use with your research professor. For the assignment, you will complete a brief written report describing hypotheses tested, statistical tools used, and your interpretation of results. If you do not have a dataset to analyze, I can help you generate one or I will try to find data for you. You will need to submit a topic for your analysis to me by November 8, and you will submit your report in the week prior to the student presentations.
- 5) Student presentation: At the end of the semester, you will present the results of your analysis and its interpretation to the class. You may include visual aids for your presentation. Student presentations will be evaluated based on clarity of the results description and associated statistical analysis.

Grading: Final grades will be based on the percentage of total points earned on the exams and assignments listed below. Letter-grade ranges will be as follows: A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; and F = 59% or below.

• 3 midterm exams (100 points each)	300
• 1 final exam (100 points)	100
• 10 laboratory exercises (10 points each)	100
• Topic for independent project (Due November 8)	5
• Lab participation	60
• Project analysis	45
• <u>Student presentation</u>	<u>50</u>
Total Possible Points	660

Note regarding academic honesty: SSU academic policy regards cheating and plagiarism as grounds for dismissal. Cheating will not be tolerated in this course.