

BIOL 4061: Design of Biological Experiments, Fall
BIOL 5061 Experimental Design & Data Analysis in Biology, Fall

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Location & Time: LSC 220; M 1:35-3:25, W 1:35-3:25

Objective: A practical introduction to the design and analysis of sampling programs and experiments in ecology, with emphasis on potential problems and pitfalls and how they can be avoided or overcome.

Format: 3-4 hours of lecture per week; take-home midterm and final exams

Prerequisite: A formal course in statistics at the second year level (eg STAT 2080) or higher. Offered to well-prepared undergraduate and graduate students

Approximate Schedule:

Introduction; Sampling design: spatial distribution
Sampling design: scale and sampling unit
Sampling design: sample size, accuracy and precision
Hypothesis testing and interpretation of experiments
t-tests: 1- and 2-sample tests; replication, power and effect size
Single factor ANOVA: model, assumptions, data transformation
Multiple comparisons of means: planned and unplanned tests
Factorial ANOVA: model, interaction, fixed and random factors
Thanksgiving Holiday
Nested ANOVA: model, applications, pooling error
ANOVA: complex models, power analysis
Nonparametric statistics and contingency tables
Midterm exam (take home, due 1 Nov)
No class – exam period
Experimental design: fundamentals
Experimental design: standard layouts and models
Midterm exam: review
Experimental design: factorial designs, split plot, repeated measures
Experimental design: problems and pitfalls
Experimental design: controls, interspersions, pseudoreplication
Environmental impact analysis: BACI designs
Experimental design: course review, evaluation
Final exam (take home, due 6 Dec)
No class – exam period
Final exam: review

Suggested Texts:

Quinn, G.P. & M.J. Keough 2002. Experimental design and data analysis for biologists. Cambridge Univ Press. QH 323.5 Q85

Krebs, C.J. 1999. Ecological methodology. 2nd Edn. Addison-Wesley QH 541.15 S72 K74

Zar, J.H. 1999. Biostatistical analysis. 4th Edition. Prentice Hall QH 323.5 Z37

Underwood, A.J. 1997. Experiments in ecology. Cambridge Univ Press QH 541.24 U5A

Lecture notes and suggested **readings**: distributed in class

Evaluation: Midterm exam: 40%; Final exam: 60% (graduate students in BIOL 5061 will be presented with more challenging exams)