

# SIO 272: Advanced Statistical Techniques

## Winter 2019

### Course Instructors:

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### Schedule:

Lecture: 11:00am – 12:20pm, Tues/Thurs

Location: Eckart 227

‘Lab’: 1:00-1:50pm or 2:00-2:50pm

Location: Eckart Computer Lab

### Textbooks:

#### Required

Crawley, MJ (2015) *Statistics: an introduction using R*. John Wiley & Sons Ltd.

(abbreviated below as ‘C’)

Underwood, AJ (1997) [\*Experiments in ecology: their logical design and interpretation using analysis of variance\*](#). Cambridge University Press. (abbreviated below as ‘U’; available as an e-book through the UCSD Library [hyper-linked to title])

#### Recommended

Zar, JH (2010) *Biostatistical Analysis* (5<sup>th</sup> ed). Prentice Hall. (abbreviated below as ‘Z’)

*Note:* Added readings from the literature will be scattered throughout

### Grading:

Students will be graded on one final exam (30%), bi-weekly exercises (50%), and participation (20%).

Note that this course will be graded upon a mixture of performance, effort, and personal advancement.

## SIO 272: Lecture schedule (Winter 2019)

### ***Weeks 1 & 2 – Expectations from random sampling***

8-Jan	Overview; theory & philosophy of statistical testing
10-Jan	Mathematical expectations with the null
15-Jan	Introduction to probability distributions
17-Jan	Sampling distributions and standard error

### **Readings**

Ch. 1-5 (U)
Ch. 1-3, Appendix (C)
Ch. 1-9 (Z), <i>as needed</i>

### ***Weeks 3 & 4 – Analysis of (simple?) experiments***

22-Jan	Experimental design and differences of means
24-Jan	Analysis of variance (ANOVA)
29-Jan	Generalizing to the linear model
31-Jan	Permutations of the ANOVA in theory

Ch. 6-10 (U)
Ch. 4-6, 8 (C)
Ch. 10-12 (Z), <i>as needed</i>

### ***Weeks 5 & 6 – Analysis of (some) natural experiments***

5-Feb	Handling relationships among continuous data
7-Feb	Patterns of association of two or more variables
12-Feb	Linking continuous and discrete factors – ANCOVA
14-Feb	Experimental design with the linear model

Ch. 8-10 (U),
Ch. 7 & 9 (C)
Ch. 17-20 (Z), <i>as needed</i>

### ***Week 7 & 8 – Describing more complex patterns***

19-Feb	Testing for (and coping with) autocorrelation
21-Feb	Spatial patterns and some ways to glean insights
26-Feb	Handling non-normal data in models
28-Feb	The slippery slope away from being frequentist – GLM

Ch. 13 (U)
Ch. 11-16 (C)

### ***Week 9 & 10 – Simplifying more complex data***

5-Mar	Handling multiple predictors
7-Mar	Considering multiple response variables
12-Mar	Diving deeper...
14-Mar	Now what? Where does all of this end?

Ch. 20-21 (Z), <i>as needed</i>
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### ***Week 11***

EXAM WEEK