

SIO 272: Advanced Statistical Techniques

Winter 2021

Course Instructors:

Stuart Sandin, Professor

Office: Hubbs Hall 4150 Phone: (858) 534 4150

email: ssandin@ucsd.edu

Clinton Edwards, PhD candidate

Office: Hubbs Hall 4100

email: clint@ucsd.edu

Schedule:

Lecture: 9:30-10:50am, Mon/Wed

Location: Video meetings**

'Lab': 9:30-10:20am, Thurs, or 9:30-10:20, Fri

Location: Hubbs 4500 (*tentative*)

*** Please note modified, and perhaps evolving, instructional format. As of 30 Dec 2020, we plan to hold the entirety of this course (Lectures and Labs) in online formats. The course is designed in a synchronous format, to encourage discussion. To support potential challenges of this format, all video content will be recorded.*

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* (5th 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 2021)

Weeks 1 & 2 – Expectations from random sampling

4-Jan	Overview; theory & philosophy of statistical testing
6-Jan	Descriptive statistics – unpacking the familiar
11-Jan	Introduction to probability distributions
13-Jan	Sampling distributions and standard error

Readings

Ch. 1-5 (U)
Ch. 1-4, Appendix (C)
Ch. 1-9 (Z), <i>as needed</i>

Weeks 3 & 4 – Introduction to analysis of experiments

18-Jan	<i>No class – Martin Luther King, Jr. Holiday</i>
20-Jan	Considering differences of means
25-Jan	Analysis of variance (ANOVA)
27-Jan	Reviewing power and potential of the ANOVA

Ch. 6-10 (U)
Ch. 5-6, 8 (C)
Ch. 10-12 (Z), <i>as needed</i>

Weeks 5 & 6 – Experimental design and more approaches of analysis

1-Feb	Permutations of the ANOVA
3-Feb	Permutations of the ANOVA (<i>cont.</i>)
8-Feb	Patterns of association of two or more variables
10-Feb	Linking continuous and discrete factors – ANCOVA

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

Week 7 & 8 – Describing more complex patterns

15-Feb	<i>No class – Presidents' Day Holiday</i>
17-Feb	Spatial and temporal structure of data
22-Feb	Handling non-normal data in models
24-Feb	The slippery slope away from being frequentist – GLM

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

Week 9 & 10 – Simplifying more complex data

1-Mar	Handling multiple predictors
3-Mar	Model fitting as we build our relationship with Rev Bayes
8-Mar	Considering multiple response variables
10-Mar	Now what? Where does all of this end?

Ch. 20-21 (Z), <i>as needed</i>

Week 11

EXAM WEEK