

SIO 272: Advanced Statistical Techniques

Winter 2022

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: 9:00-10:20am, Mon/Wed

Location: Eckart 227*

'Lab': 2:00-3:20pm, Wed, or 2:00-3:20, Thurs

Location: Eckart 225*

** Please note modified, and perhaps evolving, instructional format. As of 22 Dec 2021, we plan to hold the first two weeks 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 progress.

SIO 272: Lecture schedule (Winter 2022)

Weeks 1 & 2 – Expectations from random sampling

3-Jan	Overview; theory & philosophy of statistical testing
5-Jan	Descriptive statistics – unpacking the familiar
10-Jan	Introduction to probability distributions
12-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

17-Jan	<i>No class – Martin Luther King, Jr. Holiday</i>
19-Jan	Considering differences of means
26-Jan	Analysis of variance (ANOVA)
28-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

31-Jan	Permutations of the ANOVA
2-Feb	Permutations of the ANOVA (<i>cont.</i>)
7-Feb	Patterns of association of two or more variables
9-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

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

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

Week 9 & 10 – Simplifying more complex data

28-Feb	Handling multiple predictors
2-Mar	Model fitting as we build our relationship with Rev Bayes
7-Mar	Considering multiple response variables
9-Mar	Now what? Where does all of this end?

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

Week 11

EXAM WEEK