

SIO 272: Advanced Statistical Techniques

Winter 2020

Course Instructors:

Stuart Sandin, Professor

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

email: ssandin@ucsd.edu

Clinton Edwards, PhD student

Office: Hubbs Hall 4100

email: clint@ucsd.edu

Schedule:

Lecture: 9:30am – 10:50pm, Tues/Thurs

Location: Eckart 227

‘Lab’: 2:00-3:20pm, Tues, or 9:30-10:50, Wed

Location: Eckart 225

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 2020)

Weeks 1 & 2 – Expectations from random sampling

| | |
|--------|--|
| 7-Jan | Overview; theory & philosophy of statistical testing |
| 9-Jan | Mathematical expectations with the null |
| 14-Jan | Introduction to probability distributions |
| 16-Jan | Sampling distributions and standard error |

Readings

Ch. 1-5 (U)
Ch. 1-4, Appendix (C)
Ch. 1-9 (Z), *as needed*

Weeks 3 & 4 – Introduction to analysis of experiments

| | |
|--------|-------------------------------------|
| 21-Jan | Considering differences of means |
| 23-Jan | Analysis of variance (ANOVA) |
| 28-Jan | Generalizing to the linear model |
| 30-Jan | Permutations of the ANOVA in theory |

Ch. 6-10 (U)
Ch. 5-6, 8 (C)
Ch. 10-12 (Z), *as needed*

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

| | |
|--------|--|
| 4-Feb | Reviewing power and potential of the ANOVA |
| 6-Feb | Handling relationships among continuous data |
| 11-Feb | Patterns of association of two or more variables |
| 13-Feb | Linking continuous and discrete factors – ANCOVA |

Ch. 8-10 (U),
Ch. 7 & 9 (C)
Ch. 17-20 (Z), *as needed*

Week 7 & 8 – Describing more complex patterns

| | |
|--------|--|
| 18-Feb | Experimental design with the linear model |
| 20-Feb | Spatial and temporal structure of data |
| 25-Feb | Handling non-normal data in models |
| 27-Feb | The slippery slope away from being frequentist – GLM |

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

Week 9 & 10 – Simplifying more complex data

| | |
|--------|---|
| 3-Mar | Handling multiple predictors |
| 5-Mar | Considering multiple response variables |
| 10-Mar | Model fitting as we build our relationship with Rev Bayes |
| 12-Mar | Now what? Where does all of this end? |

Ch. 20-21 (Z), *as needed*

Week 11

EXAM WEEK