ESM 206: Statistics and Data Analysis
in Environmental Science & Management

Instructor: Allison Horst (ahorst@bren.ucsb.edu)
Office: Bren Hall Room 4406
Office Hours: M 11:30am – 12:45pm

TA: Sebastian Tapia (stapia@bren.ucsb.edu)
Office: TBD
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Lectures: Bren 1414
MW 10:00am – 11:15am

Labs: Bren Hall 3035
M 1:00pm – 2:50pm
M 3:00pm – 4:50pm
T 1:00pm – 2:50pm
T 3:00pm – 4:50pm

Course Description: Develop skills and conceptual framework to effectively use data to solve practical problems and communicate results. Topics include descriptive statistics, hypothesis testing, experimental design, exploratory data analysis, probability and uncertainty, and effectively communicating quantitative data. Emphasis on case studies from environmental problems.

Grading: 55% Homework and Lab
20% Midterm
25% Final

Course Policies:

- Assignments submitted late will only be accepted within one week of the due date, and will be worth 50% of the original score. **Homework submitted more that one week after the original due date will not be accepted.**

- Lab attendance is mandatory.

Bring to Class: Course reader (required), pen/pencil, calculator (does not need to be a graphing calculator).

TENTATIVE COURSE SCHEDULE:

Week 1: Descriptive statistics, graphical representations, getting started in Excel and RStudio, accessing data from online databases and loading into Excel and RStudio

Week 2: Basic probability theory and probability distributions, finding summary statistics in RStudio, basic data analysis in RStudio, importing and working with datasets in RStudio

Week 3: Sample uncertainties (data spread, standard deviation, standard error), the normal distribution, CLT, calculating and presenting sample uncertainties in RStudio

Week 4: Introduction to hypothesis testing, Type I and Type II errors, the *t*-distribution, calculating probabilities for the z-distribution in RStudio, meaning of the p-value, communicating results of one-sample hypothesis testing

Week 5: Two-sample hypothesis testing (*t*-tests), *t*-tests in RStudio, communicating results of two-sample hypothesis testing

Week 6: Introduction to regression (single-variate) – linear and non-linear regression, performing regression in RStudio

Week 7: ANOVA, performing ANOVA in RStudio, post-hoc testing for pairwise differences (Tukey's HSD), communicating results graphically and in text

Week 8: Chi-Square, concepts and performing chi-squared in RStudio, communicating results

Week 9: Multiple regression

Week 10: Non-parametric alternatives, course wrap-up and review