

## Syllabus

### CLRE 254 – BIOSTATISTICS II, 2 UNITS

Spring 2022

#### Course instructor

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#### Course TA

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#### Course Description

This course gives you the skills to understand and conduct advanced biostatistical analyses including multiple linear regression, logistic regression, and Cox regression. You will become familiar with adjusted and unadjusted analyses of continuous (scalar), binary, and time-to-event outcome variables. The causal approach for multi-predictor models will be emphasized, and practical model building strategies will be discussed. Models with additive and interactive effects of predictors will be introduced. We will identify common violations of model assumptions and how to address them. Data analyses will be conducted in R/Rstudio. This course is a pre-requisite for taking elective stat courses.

#### Course Organization

Two 50-minute sessions per week. Case studies will be introduced and discussed for each key statistical method. We will also conduct interactive data analysis sessions using R. Students will work in small groups and individually.

#### Course Goals

Provide the knowledge, tools, and practical experience for the workhorses of advanced statistics needed to analyze cross-sectional observational studies and randomized clinical trials.

#### Course Objectives

1. Develop a conceptual understanding of common statistical methods appropriate for biomedical data, including linear regression, logistic regression, and survival analysis methods. Understand and know how to apply model building and model selection.
2. Develop the ability to read critically and understand the aspects of study design and statistical analysis from the scientific biomedical literature.
3. Develop facility with examining and analyzing biomedical datasets using appropriate statistical methods, in R/Rstudio.

#### Prerequisites and Preparation

Biostatistics I or equivalent.

#### Course Materials/Resources – Required and Recommended

- Textbook: Vittinghoff E, Glidden D, Shiboski S, and McCulloch C, *Regression Methods in Biostatistics*, 2<sup>nd</sup> ed. 2012. Available through UC SpringerLink license, posted on Canvas.
- Other Materials: Detailed course notes are provided
- Computer software: R and Rstudio will be used in class, for homework, and for the final exam.
- Online resources: <https://canvas.ucsd.edu>. Extensive resources on R are available online.

**Course Schedule**

Lect	Date	Topic	Reading	Assignment
L1	Mar 31	Linear regression: single predictor	RMB 4.1-4.3	
L2	Apr 7	Linear regression: multiple predictors	RMB 4.4-4.6	Hw1 due
L3	Apr 14	Checking linear model assumptions	RMB 4.7,4.8	Hw2 due
L4	Apr 21	Causal inference and model building	RMB 9.2, 10.2	Hw3 due
L5	Apr 28	Logistic regression	RMB 5.1, 5.2	Hw4 due
L6	May 5	Logistic regression	RMB 5.3-5.7	Hw5 due
L7	May 12	Predictive modeling	RMB 10.1, 10.3, 5.2	Hw6 due
L8	May 19	Survival analysis	RMB 3.5, 6.1, 6.2	Hw7 due
L9	May 26	Survival analysis: Cox model extensions	RMB 6.2-6.5	Hw8 due
L10	Jun 2	Recapitulation		Hw9 due
Final	Jun 9	Final Exam		

**Course Components**

- Weekly assignments, to be submitted through Canvas.
- Homework is due at 11:59pm, on the following Thursday. Late homework is not acceptable.
- The only acceptable format is .pdf. Do not submit raw R output.
- One homework submission for **a group of two students**. Groups are assigned by instructor via Canvas, and changed once during the quarter.

**Final Exam**

- 3h exam over the internet, 11<sup>th</sup> week of the course. The exam will involve data analysis in R, and/or hand calculations.
- A make-up exam date will be set up for students with extenuating circumstances. The student should make arrangements with the instructor in advance (at least two weeks if possible).
- *The best tool for preparing the final exam is practice on the prior final exams, posted on course website.*

**Grading Policy**

- The course grade will have two components: Homework (40%) and Final exam (60%).
- **All students receive a final grade bonus of 0-2 percentage points, based on completed evaluation by the class as a whole (0% = 0 points, 100% = 2 points, with linear interpolation in-between).**
- Plagiarism will be dealt with according to the UCSD Policy of Integrity of Scholarship
- See your grades on Canvas [canvas.ucsd.edu](https://canvas.ucsd.edu) (if you are matriculated- in MAS Program), or on MyExtension <https://myextension.ucsd.edu/> (if you are non-matriculated/CREST, concurrent enrollment)

Grade thresholds use the UCSD grading scheme:

Grade	Total Score	Grade	Total Score
A	94-100	C+	77-79.9
A-	90-93.9	C	74-76.9
B+	87-89.9	C-	70-73.9
B	84-86.9	D-/D/D+	≥61/64/67
B-	80-83.9	F	0-60.9

### **Course Policy and Expectations (classroom rules of conduct)**

- Time Commitment: Expect to spend 4-6 hours a week outside of class.
- Attendance Policy: The general CREST attendance policy applies, no more than 3 missed sessions are allowed. You have to be present in both halves of the class.

Note: this policy is suspended during COVID-related remote learning. The students not present at class time are expected to review the video lectures asynchronously.

- Academic Integrity (Plagiarism): <http://academicintegrity.ucsd.edu/>
- Late homework is not acceptable.

### **Communication with lecturer and teaching assistant**

The best way to reach us is via email. We will respond within 24 hours under usual circumstances.

### **Student Evaluation of Course and Faculty**

Course and faculty evaluations provide important feedback to instructors to improve course content and teaching methodology. The evaluations are also an important factor in faculty advancement. A link to one-time course evaluations will be made available via Canvas. All students will receive a final grade bonus of 0-2 percentage points, based on evaluation completion by the class as a whole (0% = 0 points, 100% = 2 points, with linear interpolation in-between).

### **Technical Requirements**

The students should bring their laptop with R and Rstudio installed to every class, and conduct analyses at the same time with the instructor.

**Accommodations:** If you have a disability that may impact your academic performance, you may request accommodations by submitting documentation to: <https://students.ucsd.edu/well-being/disability-services/>