

Course Syllabus – TRBIO 520

Course Information

Course Number: TRBIO 520 FA20
Course Name: Advanced Methods in Statistical Analysis
Term: FA 2020
Start Date: 09/09/2020
End Date: 12/11/2020
Credits: 3.0

Meeting Days / Times

Mondays and Wednesdays, 1:00-2:30pm PT / 4:00-5:30pm ET
(See Calendar in Canvas for the most up-to-date schedule.)

Location

Online via Zoom

Course Managers

Role	Last Name	First Name	Email Address
Instructor	Wineinger	Nathan	nwineing@scripps.edu
Instructor	Bagsic	Samantha	bagsic.samantha@scrippshealth.org
TA	Tu	Roger	rogertu@scripps.edu

Course Description

This course introduces students to more advanced methods in statistical analyses. The course topics include multivariable and generalized linear models, survival analysis and repeated measures, approaches to simulate data, study design considerations and statistical power, summarizing and validating statistical results, dimensionality reduction for wide data, and an introduction to Bayesian statistics. Topics will be covered on a weekly basis and includes a didactic lecture followed by an applied lab where students will perform statistical analyses in class. The course is meant to prepare students for common statistical analysis issues that may arise in their own research, but when more introductory approaches are not appropriate. At the conclusion of the course, students will present the results from an assigned data analysis task to the class, demonstrating their technical skill and their ability to interpret these findings.

Program Learning Outcomes

By the end of the program, students will have accomplished these objectives:

PLO1: Critique peer-reviewed publications

PLO2: Understand approaches and methodologies needed for complex scientific questions

PLO3: Knowledgeable of a wide array of technical research skills used in drug discovery

PLO4: Possess strong communication skills

Course Learning Outcomes

Upon completion of this course students will be able to:

CLO1: Recognize appropriate statistical methods.

CLO2: Perform statistical analyses.

CLO3: Interpret statistical results.

CLO4: Present statistical results.

Background Preparation (Prerequisites)

Students should have taken the *Introduction to Biostatistics* class or equivalent. Basic R programming skills are required.

Course Materials

N/A

Class Format

Generally, Monday classes will include didactic lectures on course topics, and Wednesdays will be an in-class data analysis lab covering these topics. Four homeworks, an in-class and take-home midterm, and final presentation will be assigned.

Expectations and Logistics

Students should bring a laptop to the Wednesday labs.

Attendance Statement

Students are expected to attend all classes. Students who are unable to attend class must seek permission for an excused absence from the course director or teaching assistant. Unapproved absences or late attendance for three or more classes may result in a lower grade or an “incomplete” for the course. If a student has to miss a class, he or she should arrange to get notes from a fellow student and is strongly encouraged to meet with the teaching assistant to obtain the missed material.

Scientific and Professional Ethics

The work you do in this course must be your own. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. You must explicitly acknowledge when your work builds on someone else's ideas, including ideas of classmates, professors, and authors you read. If you ever have questions about drawing the line between others' work and your own, ask the course professor who will give you clear guidance. Exams must be completed independently. Any collaboration on answers to exams, unless expressly permitted, may result in an automatic failing grade and possible expulsion from the Graduate Program.

Technology Requirements and Support

For issues related to Canvas, please contact the Graduate Office by email at: gradprgm@scripps.edu or by phone at: 858-784-8469.

Course Grading

Grading is in accordance with the academic policies of the Skaggs Graduate School. The breakdown of grading is as follows:

- Homeworks: 40% (4x10%)
- Midterm Exams: 30% (15% in-class, 15% take-home)
- Final Presentation: 30%

Letter Grade	Percent	GPA	Description
A	93-100	4.00	Outstanding achievement. Student performance demonstrates full command of the course subject matter and evinces a high level of originality and/or creativity that far surpasses course expectations.
A-	90-92	3.67	Excellent achievement. Student performance demonstrates thorough knowledge of the course subject matter and exceeds course expectations by completing all requirements in a superior manner.
B+	87-89	3.33	Very good work. Student performance demonstrates above-average comprehension of the course subject matter and exceeds course expectations on all tasks as defined in the course syllabus. There is notable insight and originality.
B	83-86	3.00	Satisfactory work. Student performance meets designated course expectations and demonstrates understanding of the course subject matter at an acceptable level.

B-	80-82	2.67	Marginal work. Student performance demonstrates incomplete understanding of course subject matter. There is limited perception and originality.
C+	77-79	2.33	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
C	73-76	2.00	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
P	73-100	0.00	Satisfactory work. Student performance demonstrated complete and adequate understanding of course subject matter. Course will count toward degree.
F	0-72	0.00	Unacceptable work/Failure. Student performance is unacceptably low level of knowledge and understanding of course subject matter. Course will not count toward degree. Student may continue in program only with permission of the Dean.
I		0.00	Incomplete is assigned when work is of passing quality but is incomplete for a pre-approved reason. Once an incomplete grade is assigned, it remains on student's permanent record until a grade is awarded.
W		0.00	Withdrew from the course with Dean's permission beyond the second week of the term.

- All courses will be recorded and maintained in the student's permanent academic record; only courses that apply towards the degree will appear on the academic transcript. Non-credit or audited courses will not appear on the transcript.
- 4 core courses taken for a letter grade (pass = B- or higher for a core course)
- 2 elective courses taken pass/fail (pass = A, B, C for an elective)

Because students are encouraged to take electives outside their area of expertise, a "C" letter grade is passing.

Course Schedule:

Date	Details
Mon Sep 7, 2020	Labor Day (No Class)
Wed Sep 9, 2020	Introduction (Bagsic/Wineinger)
Fri Sep 11, 2020	Graduate Student Symposium (No Class)
Mon Sep 14, 2020	Review of statistical principles (Bagsic)
Wed Sep 16, 2020	Review of R programming and notebooks (Bagsic)
Mon Sep 21, 2020	Multivariable regression (Wineinger)
Wed Sep 23, 2020	Lab (Wineinger)
Mon Sep 28, 2020	Generalized linear models (Wineinger)
Wed Sep 30, 2020	Lab (Wineinger)
Mon Oct 5, 2020	Survival analysis (Bagsic)
Wed Oct 7, 2020	Lab (Bagsic)
Mon Oct 12, 2020	Repeated measures and autocorrelation (Wineinger)
Wed Oct 14, 2020	Lab (Wineinger)
Mon Oct 19, 2020	Review (Bagsic/Wineinger)
Wed Oct 21, 2020	Assignment In-Class Midterm
Mon Oct 26, 2020	Simulating data (Wineinger)
Wed Oct 28, 2020	Lab (Wineinger)
Mon Nov 2, 2020	Statistical power (Bagsic)
Wed Nov 4, 2020	Lab
Mon Nov 9, 2020	Cross validation and meta-analysis (Wineinger)
Wed Nov 11, 2020	Lab (Wineinger)
Mon Nov 16, 2020	Dimensionality reduction and shrinkage (Bagsic/Wineinger)
Wed Nov 18, 2020	Lab (Wineinger/Bagsic)
Mon Nov 23, 2020	Overview of final presentations
Thu Nov 26, 2020	Thanksgiving Holiday (No Class)
Fri Nov 27, 2020	Thanksgiving Holiday (No Class)
Mon Nov 30, 2020	Bayesian statistics (Wineinger)
Wed Dec 2, 2020	Lab (Wineinger)
Mon Dec 7, 2020	Final presentations
Wed Dec 9, 2020	Final presentations