SIO187 – STATISTICAL METHODS IN MARINE BIOLOGY
Winter 2020
Lecture: MWF 10:15am – 11:05pm, Eckart 227

Lab A01: Thu 12:00pm – 12:50pm, Eckart 225
Lab A02: Thu 1:00pm – 1:50pm, Eckart 225

Note that the information in this syllabus is subject to change. Any changes will be announced in class and posted to Blackboard. Be sure to frequently check the website to keep up-to-date with readings, assignments, and exam schedules.

Grading
- Lab attendance and assignments = 20% (10 pts/Lab)
- Homework = 20% (10 pts/HW)
- Project = 15% (75 pts)
- Midterm = 20% (100 pts)
- Final = 25% (125 pts)

Textbook (required)
- Whitlock & Schluter (2015) *The Analysis of Biological Data, 2nd edition*, Roberts & Company Publishers.

The textbook is available in the UCSD bookstore. There are also copies set aside in the course reserves. Please see me if access to the book will be a burden.

Contact information
Instructor
Dr. Dovi Kacev (He/Him/His)
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Office Hours: MW 11:15am – 12:15pm, Hubbs 3130 or by appointment

Teaching Assistant
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COURSE DESCRIPTION

SIO187 will introduce students to the fundamentals of experimental design and quantitative analysis of data in biological oceanography. Students will learn to test hypotheses with a suite of statistical tests, including: t-tests, ANOVA, regression and correlation analysis, and non-parametric methods. They will also explore the meaning and utility of statistical distributions such as Gaussian, binomial, and Poisson. Hands-on data analysis will be done with the R software package during lab sessions.

LEARNING OUTCOMES

Students should expect to become familiar with some of the tools available to analyze environmental data. They will also be comfortable clearly presenting their results and interpreting the findings of other studies. By the end of the quarter, student will be able to:

1. Understand the foundations of statistics.
2. Recognize the assumptions and limitations of statistical tests.
3. Evaluate and analyze different types of biological data.
4. Interpret and communicate statistical output.
5. Use tools available in R to conduct analyses.

COURSE EXPECTATIONS

This class will challenge you to think critically about how data is collected, analyzed and presented. This is the very core of the scientific method. To excel in this course, you will need to go beyond simply applying equations and doing calculations; rather, you will have to understand these tools and be able to apply them in a deliberate, well-reasoned way. Although the class will introduce you to specific tools and tests, you will need to think more generally about difficulties associated with collecting environmental data.

Developing this level of understanding requires practice. As such, the course will be very focused on practical application and problem solving. I intend to limit direct lecturing to less than half of our allotted class time. I hope to spend the rest of the class on working problems, discussing techniques, and doing analysis. This work will be reinforced in lab where you will be working with data using R.

To get the most out of the class, you will need to do the assigned reading and homework ahead of time. I expect you to come to class prepared and ready to ask questions. Likewise, you will occasionally be asked to do preparatory coding assignments on DataCamp. These are intended to teach you the mechanics of R that you will be practicing in lab.

GROWTH MINDSET

This class will cover material that is new to you. You are not expected to be an expert at this yet. The goal of the class is to learn and grow. Do not fret if this material is hard…it should be, that is expected. Additionally, we all have different experience with mathematics, and we will work with everyone to make sure that the material is accessible. When in doubt, feel free to come to Office Hours or e-mail the professor or TA.

CLASS POLICIES
Social Integrity:

This class and UCSD are an inclusive environment. We are dedicated to fostering respect for all people.

Academic integrity

Students are expected to adhere to the University's policy on academic integrity. To paraphrase: do not copy another student's work, do not plagiarize work from an outside resource, do not do work for someone else, and do not make use of materials explicitly excluded by the instructor. Basically, be smart, respectful, and collegial. Please feel free to ask me if you have any questions or concerns about a matter related to academic integrity.

You are encouraged to work on homework and labs in groups. Regardless of the amount of collaboration, I will expect you to turn in your own assignments. Do not hesitate to ask for clarification on the expectations for any particular assignment.

Under no circumstances will cheating be tolerated. I will fail any student caught engaging in academic dishonesty. A student caught cheating will be subject to additional penalty from UCSD up to and including suspension.

For more information on academic integrity please refer to The Policy on Integrity of Scholarship (academicintegrity.ucsd.edu).

Labs

Attendance and completion of labs and associated assignments account for 20% of your final grade. Missing more than 4 labs will result in failing the whole course. The labs will be a combination of problem solving, computer assignments, and projects. There will be graded lab assignments that count toward the final grade.

Lab work will be done with the R statistical package. All the computers in the lab space have the software loaded and are ready to use. One of the many nice things about R is that it is free. If you would like to load it on your personal computer for more practice or to complete labs at home, navigate to https://cran.r-project.org/ and follow the instructions. To install RStudio, go to https://www.rstudio.com/products/rstudio/download/ (note that R must first be installed before RStudio). Please feel free to get in touch with me if you are experiencing difficulties.

Several concepts will be introduced before lab with DataCamp, an online tutorial module. These exercises are separate from lab activates and are meant to introduce tools. You will not be graded on these exercises, but they will be checked for completion.

Late work

You are encouraged to complete all assignments on time. The course work is cumulative and catching up might be difficult. Late assignments will be accepted, docked one letter grade per class after the due date.

Regrades

If you believe an error has occurred in grading, you may bring it to the attention of the instructor within one week of the assignment being returned. Please do not go to the TA for a regrade. You must submit the regrade request with a written description of the grading error. Regrade requests on an exam completed in pencil will not be accepted.

Missed exams

There are no make-up exams. If you miss an exam, you will be required to provide official documentation of an unavoidable emergency (e.g. serious illness, etc). Without such documentation, you will receive a failing grade for the exam.

Mid-term: A missed mid-term cannot be taken at a later date. With appropriate documentation of an unavoidable emergency, your grade will be scaled to maintain the grade you would receive based upon all other assignments.

Final: A missed final exam cannot be taken at a later date. With appropriate documentation of an unavoidable emergency, you will receive an incomplete for the course. You will then need to make arrangements to complete the class in the following year.

Excused absence final exam

If you cannot be present in the classroom for an exam and can present a valid excuse (such as a note from your coach for a sporting event), then a sealed copy of the exam will be given to the coach, musical director, etc., who will administer the exam at the class exam time. You must present the documentation at least 1 week in advance of the exam. If no UCSD official can be found to administer the exam, then it will count as a missed exam. If the exam cannot be taken on the class exam day, then it will count as a missed exam. No exam can be taken before or after the scheduled exam date.

Accessibility

Please contact me in person or via email if you have a disability or condition that might affect your ability to participate in class or require any accommodations. I will work with you and the Office for Students with Disabilities (OSD) to make any necessary accommodations. If you are more comfortable having a staff member at OSD contact me instead, feel free to do so.

SCHEDULE (SUBJECT TO CHANGE)

Day	Date	Topic	Reading	Homework
M	1/6/2019	Intro to Stats	Ch 1	
W	1/8/2019	Plotting data	Ch 2	HW1: DataCamp Assignment 1 due
F	1/10/2019			With allowance due to complications
M	1/13/2019	Describing data (Central Tendency and Spread)	Ch 3	
W	1/15/2019	Samples and Population (Estimation and uncertainty)	Ch 4	HW2: 1.14, 1.15, 2.20, 2.24, 2.34
F	1/17/2019			
M	1/20/2019	MLK Day		
W	1/22/2019	Probability	Ch 5	HW3: 3.15, 3.17, 4.15, 4.17, 4.23
F	1/24/2019	Hypothesis Testing	Ch 6	
M	1/27/2019	Binomial	Ch 7	
W	1/29/2019	Chi Square	Ch 8	HW4: 5.20, 5.21, 5.26, 6.15, 6.21, 6.25
F	1/31/2019	Poisson	Ch 9	
M	2/3/2019	Gaussian Distributions	Ch 10	
W	2/5/2019			HW5: 7.18, 7.21, 8.11, 8.14, 8.17
F	2/7/2019	Midterm		
M	2/10/2019	One sample T test	Ch 11	
W	2/12/2019	Two sample T test	Ch 12	HW6: 9.21, 10.15, 10.26, 11.14, 11.18
F	2/14/2019	Violations of Assumptions	Ch 13	
M	2/17/2019	Presidents' Day		
W	2/19/2019	Correlation	Ch 16	HW7: 12.18, 12.22, 13.19, 13.21
F	2/21/2019	Regression	Ch 17	
M	2/24/2019	ANOVA	Ch 15	
W	2/26/2019	ANOVA continued		HW8: 16.15, 16.23, 17.19, 17.23
F	2/28/2019	Modern Advances	TBD	
M	3/2/2019	Modern Advances	TBD	
W	3/4/2019	Modern Advances	TBD	HW9: 15.23, 15.30, TBD
F	3/6/2019	Modern Advances	TBD	
M	3/9/2019	Modern Advances	TBD	
W	3/11/2019	project presentations		HW10: TBD
F	3/13/2019	project presentations		
F	3/20/2019	Exam (8 am - 11 am)		