ESS 330 - Quantitative Reasoning for Ecosystem Science
Spring 2019

Instructor:
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NESB 104A (Shared Office-Not Used for Office Hours)

Graduate Teaching Assistants:

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Office Hours:
Amanda Shores: Mondays 11-12
Jemma Fadum: Tuesday 10-11
Amanda Cordeiro: Thursday 10-11
Or by appointment for any of the above.

Class Times:

Lectures: Mondays and Wednesdays from 10:00 – 10:50, Stadium 1204
Labs: Section 01: Thursdays, 8:00 – 9:50 in NR 232, West Lab (Jemma)
Section 02: Thursdays, 2:00 – 3:50 in NR 232, West Lab (Amanda)
Section 03: Thursdays, 4:00 – 5:50 in NR 232, West Lab (Jemma)
Section 04: Fridays, 12:00 – 1:50 in NR 232, West Lab (Amanda)

Prerequisite: MATH 155/160; STAT 301/307/315; ESS 211 or LIFE 320

University Academic Policies:
http://catalog.colostate.edu/general-catalog/academic-standards/academic-policies/

University Disability Services: http://accessibility.colostate.edu/
If you have a disability or need assistance, please see the instructors directly

Academic Integrity/Misconduct
The foundation of a university is truth and knowledge, each of which relies in a fundamental manner upon academic integrity and is diminished significantly by academic misconduct. Academic integrity is conceptualized as doing and taking credit for one's own work. A pervasive attitude promoting academic integrity enhances the sense of community and adds value to the educational process. All within the University are affected by the cooperative commitment to academic integrity.

Faculty/instructors shall work to enhance a culture of academic integrity at the University. Examples of academic misconduct include (but are not limited to):

- Cheating – Cheating includes using unauthorized sources of information and providing or receiving unauthorized assistance on any form of academic work or

engaging in any behavior specifically prohibited by the instructor in the course syllabus or class presentation.

- Plagiarism – Plagiarism includes the copying of language, structure, images, ideas, or thoughts of another, and representing them as one's own without proper acknowledgment, and is related only to work submitted for credit. Also included is the failure to cite sources properly; sources must always be appropriately referenced, whether the source is printed, electronic or spoken.
- Unauthorized Possession or Disposition of Academic Materials – Unauthorized possession or disposition of academic materials includes the unauthorized selling or purchasing of examinations, term papers, or other academic work; stealing another student's work; and using information from or possessing exams that an instructor did not authorize for release to students.
- Falsification – Falsification encompasses any untruth, either verbal or written, in one's academic work.
- Facilitation of any act of Academic Misconduct – Facilitation of any act of academic misconduct includes knowingly assisting another to commit an act of misconduct.

Any work that is found to have been directly copied from other work or another person will be given a zero for the full assignment or exam. There is no reason to directly quote anything for this course. Looking at another student's exam during exam periods or using a cheat sheet will result in an automatic zero. If any of these academic integrity violations happen twice in a semester, the student will be given an F.

Course Description: This course provides an overview of ecosystem analyses using models and data, emphasizing critical thinking skills, and quantitative representation of interactive systems. The wisdom of decisions on sustainable management of ecosystems depends on using data to evaluate alternative policies and actions. Our understanding of how ecosystems work requires that we bring data together with models. This course is about how to use quantitative information to judge the validity of hypotheses concerning ecosystem structure, function, and sustainable management.

Course Objective: To challenge students to think critically using data to help inform answers to questions and develop a better understanding of how ecosystems work.

Textbook: None required

Course format and student Responsibilities: The course will consist of two 50-minute lectures per week, as well as one 2-hr laboratory period per week. Labs will be held in the NR computer laboratory, where students will critically work through problems, challenging questions with data (*see class schedule below*). Most of these labs will involve the use of a computer and software used to development models or plot, explore, graph and analyze data.

Educational Philosophy: My role in the learning process is to present material to you in an interesting and understandable manner. I also think it is important to engage students in the learning and educations process, whenever possible. I will work hard to do this and to help you achieve the student expectations listed below. ***I expect you to attend ALL classes and labs, to actively participate in class, to do all assignments on time, and to regularly check the course Canvas page***. If you have problems with concepts, materials, or my teaching style, please come see me. Not everyone learns the same way. Maybe we can adjust teaching to help you learn better. I am very approachable, and am always open for suggestions and constructive criticism.

Classroom Environment and Etiquette: It is very important that you be courteous and respectful to your instructors, Tas, other students, and any guest lecturers. To do so, you must be prompt for class, ***turn off your cell phones and do not use them in class***, and do not speak when others are speaking. Feel free to ask questions in and out of class. Also, feel free to provide feedback on class materials, assignments and readings throughout the semester. Student must adhere to the CSU principles of academic integrity.

We will be regularly having students rotate seats to facilitate better engagement with the material and other students.

Please bring laptops if you can to class and labs if you have one.

Student Expectations - what you should expect to get out of this class:
Begin to think critically about scientific questions and use data to understand and challenge questions about how ecosystems function and how management of these systems works.

More specifically, your goals are to:

1) Understand data, from collection to interpretation.
2) Understand hypothesis testing, and multiple working hypotheses.
3) Be able to think critically, deductively and inductively.
4) Understand the fundamental principles of gaining insight from data.
5) Understand and embrace uncertainty.
6) Be able to use data to estimate parameters and make forecasts using simple models of ecosystem processes.
7) Be able to interpret and evaluate arguments based on quantitative analyses of data using mathematical models and commonly used statistical techniques.
8) Understand the space and time domains of data and models.

*Class schedule and reading responsibilities: *Calendar subject to change*

	Week	Lecture Topic	Reading	Lab Period
1	January 20, 2019	1) Introduction & What is QR. **Assignment 1: Due Friday, Jan 24 by midnight.**	**Restif et al. 2012. Read before next Monday. Submit ~1/3 page summary single spaced by 9:59 am Monday, Jan 27.**	***No Lab this week***
2	January 27, 2019	1) Data and Evidence 2) Group Discussion MGF	**Platt 1964. Read before next Monday. Submit ~1/3 page summary single spaced by 9:59 am Monday, Feb 3.**	**Assignment 2**: Graph interp. thought experiment ***(Due 1 minute before your next lab period on Canvas)*** Jan. 26-Last Day for Adding a Class Without An Override
3	February 3, 2019	1) Scientific method 2) Hypothesis testing		**Assignment 3:** Intro to Data and Excel ***(Due 1 minute before your next lab period on Canvas)*** *Feb. 5-Last day to drop*
4	February 10, 2019	1) Units 1 2) Intro to R		**Assignment 4:** Units - Group Homework ***(Due 1 minute before your next lab period on Canvas)***
5	February 17, 2019	T-tests, ANOVA		**Assignment 5:** Basic Statistics in Excel
6	February 24, 2019	Regression		**Assignment 5 Continued:** Basic Statistics in Excel. ***(Due 1 minute before your lab the week of March 2 on Canvas)***
7	March 02, 2019	1) Introduction to R 2) R continued		**Assignment 6:** Introduction to R-How Does it Compare to Excel
8	March 9, 2019	1) R continued 2) Review for Midterm I		**Assignment 6 Continued:** Introduction to R-How Does it Compare to Excel. ***(Due by Friday, March 13 at midnight)***
9	March 16, 2019	Spring Break		

10	March 23, 2019	1) ***Midterm I*** 2) Research Talk		**No Lab this Week**
11	March 30, 2019	Multivariate Models		**Assignment 7:** Multiple Regression
12	April 6, 2019	Multiple Regression		**Assignment Continued 7:** Multiple Regression, ***(Due 1 minute before your lab the week of April 13 on Canvas)***
13	April 13, 2019	PCA Analysis		**Assignment 8:** PCA
14	April 20, 2019	PCA Analysis Continued		**Assignment Continued 8:** PCA, ***(Due 1 minute before your lab the week of April 27 on Canvas)***
15	April 27, 2019	1) Introduction to Models 2) Jemma Research Talk		**Final Review**
16	May 4, 2019	1) ***Final Exam Review*** 2) ***Final Exam-During Last Class Session in the Same Class Room***		**No Lab**

Grading

Attendance (6 Random Class/Lab Periods-Taken at the End of the Period) 10%
Reading Write Up (2) 05%
Midterm Examination (1) 20% 20%
Assignments (8) 6.88% each (***late assignments will not be accepted***) 55%
Final Examination (Last day of Lecture) 10%
No Curve

Working Together: For exercises and assignments, you are welcome to work together to problem solve, and figure things out, but you are expected to write up your own individual assignment, and hand in your own individually conducted work, including results (models, graphics, tables, etc.) and writing.

All materials will be submitted through Canvas. Make sure to ***submit as a PDF*** every time (not a word doc or text file). Canvas can distort other file types. Always check your submission to make sure it is displayed correctly. *We will not allow late submissions due to problems arising from submitting of the wrong file type.*

If you would like to include a copy of your work that is written out, you can take a picture (or scan), insert this into your word document, then export as a PDF and upload to Canvas. ***Please always show your work to ensure you receive the maximum amount of credit.***