BAE 495/590 Applied Statistics for Environmental and Agricultural Data Analysis
Spring 2018, 3 credits

Class meeting times	Lectures – Monday, Wednesday: 1:30 – 2:45 PM, 125 Weaver Labs Problem session – Friday: 1:30 – 3:20 PM, 144 Weaver Labs
Pre-requisites	BAE 200 or permission from instructor
Instructor	Natalie Nelson, PhD Email – nnelson4@ncsu.edu Phone – 919-515-6741 Office – 152 Weaver Labs Office hours – Wednesdays: 2:45 – 4:00 PM, and by appointment.
Teaching Assistant	Lise Montefiore Email – lrmontef@ncsu.edu Office – 157 Weaver Labs Office hours – Tuesdays: 9:00 – 10:00 AM, Thursdays: 9:00 – 10:00 AM, 2:00 – 3:00 PM, and by appointment.
Course description	This course provides students with a fundamental and practical understanding of basic statistical concepts. Students will apply statistical methods learned in class to real data collected in environmental and agricultural systems during weekly problem sessions. During labs, students will manage and analyze data by coding in R, an open-source programming language. Students are not required to have coding experience prior to taking the course. This course does not fulfill a General Education Program (GEP).
Learning outcomes	Upon successfully meeting course requirements, students will have the skills and knowledge to: – Solve fundamental statistics problems – Produce findings on environmental/agricultural system dynamics through basic statistical analyses of environmental/agricultural data – Prepare R code for data management, analysis, and visualization
Materials	**Software (required):** – R version 3.4.3 • Windows: http://archive.linux.duke.edu/cran/ • Mac: http://archive.linux.duke.edu/cran/ – RStudio Desktop (free version): https://www.rstudio.com/products/rstudio/download/#download **Books (optional):** – Kottegoda, N.T., and R. Rosso, 2008. Applied Statistics for Civil and Environmental Engineers, Second Edition, Blackwell Publishing. 718 pgs. **E-book available for free through NCSU Libraries* – Gotelli, N.J., and A.M. Ellison, 2013. A Primer of Ecological Statistics, Second Edition, Sinauer Associates, Inc. 614 pgs.

- Helsel, D.R. and R. M. Hirsch, 2002. Statistical Methods in Water Resources Techniques of Water Resources Investigations, Book 4, chapter A3. U.S. Geological Survey. 522 pgs.
  **Free e-book: https://pubs.usgs.gov/twri/twri4a3/html/toc.html*
- Wickham, H., and G. Grolemund, 2017. R for Data Science, O'Reilly Media, Inc. 492 pgs.
  **Free e-book: http://r4ds.had.co.nz/*

Student assessment

Students will be evaluated based on a combination of class activities. The final grade will be assessed with the following criteria:

- Homework (15%)
- Exam (20%)
- Lab reports (40%), *prepared individually*
- Final project (25%), *completed in groups*

Grading scale

97	≤	A+	≤	100	73	≤	C	<	77
93	≤	A	<	97	70	≤	C-	<	73
90	≤	A-	<	93	67	≤	D+	<	70
87	≤	B+	<	90	63	≤	D	<	67
83	≤	B	<	87	60	≤	D-	<	63
80	≤	B-	<	83	0	≤	F	<	60
77	≤	C+	<	80					

This course uses standard NCSU letter grading.

Attendance policy

Students are expected to attend all lectures and problem sessions. **Each unexcused *problem session* absence will result in a 2% deduction to your overall grade.** An absence is defined as missing more than 10 minutes of class.

Late submission policy

All late submissions are subject to a 20% penalization. Assignments submitted more than 24 hours after the deadline will not be accepted.

Email policy

For questions related to assignments, please first contact your Teaching Assistant. When contacting Dr. Nelson with questions or comments regarding the course, please do the following:

- Copy the Teaching Assistant to the message, unless the matter is personal and you feel more comfortable contacting the Instructor only
- In the subject line, start with "BAE 495/590" and include a brief description of your question/comment

Taking these steps will help to ensure your message is replied to promptly. You can expect a reply from your Instructor or Teaching Assistant within one business day of it being sent.

Electronic course components

Course materials, announcements, and discussions will be delivered through the course Moodle page. Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Academic integrity	Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01. Your signature on any test or assignment indicates "*I have neither given nor received unauthorized aid on this test or assignment*." Adherence to the honor pledge is implicit in submission of work by electronic means.
Student accommodations	Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office (https://dso.dasa.ncsu.edu/) at Suite 2221 Student Health Services Building, 2815 Cates Ave., Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) (https://policies.ncsu.edu/regulation/reg-02-20-01/).
Equal opportunity and non-discrimination policy	NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05, http://www.ncsu.edu/equal_op/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.
Summary of NCSU policies, rules, and regulations	Students are responsible for reviewing the NC State University PRR's which pertains to their course rights and responsibilities: – Equal Opportunity and Non-Discrimination Policy Statement https://policies.ncsu.edu/policy/pol-04-25-05 with additional references at https://oied.ncsu.edu/equity/policies/ – Code of Student Conduct https://policies.ncsu.edu/policy/pol-11-35-01 – Grades and Grade Point Average https://policies.ncsu.edu/regulation/reg-02-50-03 – Credit-Only Courses https://policies.ncsu.edu/regulation/reg-02-20-15 – Audits https://policies.ncsu.edu/regulation/reg-02-20-04/

Tentative course schedule *(subject to change)*

Week	Topic	Problem Session
1: Jan 08	Intro to data science and statistics	DataCamp Intro to R *https://www.datacamp.com/courses/free-introduction-to-r%20*
2: Jan 15 ***no class M***	Exploratory data analysis	Exploratory data analysis
3: Jan 22	Summary statistics, principles of data visualization	Data visualization *ggplot2*
4: Jan 29	Summary statistics, measures of probability	Importing & tidying data *readr, tidyr*
5: Feb 05	Random variables and probability distributions	Working with dates/times, wrangling data *lubridate, dplyr*
6: Feb 12	Random variables and probability distributions	Functions
7: Feb 19	Random variables and probability distributions	Data analysis
8: Feb 26	Hypothesis testing	Data analysis
9: Mar 05	---------- *SPRING BREAK* ----------	
10: Mar 12	ANOVA	Data analysis
11: Mar 19	Linear regression	Data analysis
12: Mar 26 ***no class F***	**Exam Week**	--
13: Apr 02	Multiple linear regression	Data analysis
14: Apr 09	Cross-correlation, autocorrelation, seasonality in env/ag time series	Work on final project
15: Apr 16	Communicating code & data *R Markdown*	Work on final project
16: Apr 23	Work on final project	Present final projects