ENR 2000 Natural Resources Data Analysis

Fulfills a General Education Goal for Data Analysis

http://asccas.osu.edu/curriculum/ge-goals-and-learning-outcomes

3 credits

Term: **Autumn 2023**

Times and Location: **Class MW 8:00 – 8:55 am Ag Admin Rm 108; Lab W 3:00 – 5:00 pm or Th 12:15-2:15 pm Kottman Hall 231A (refer to your schedule for your lab section).**

Should in-person classes be canceled, I will notify you as to which alternative methods of teaching will be offered to ensure continuity of instruction for this class. Communication will be via [CarmenCanvas, email or other mode of communication].

Course Format: We will meet for 1 hour for MW morning lecture and 2 hours one afternoon a week for lab. Any peripherals used will be available to you after the lecture material is completed. Labs will follow closely with lecture material. Attendance for the lecture will not be mandatory, but attendance for the lab times will be mandatory. Laboratory attendance will be checked at the beginning and in the middle of lab. If you need to leave early for a special circumstance, please let the instructor know ahead of time so that you will not be marked absent.

Instructor:

H. Alexis Londo londo.4@osu.edu, Mobile 614-495-6738, Kottman Hall 375C,
Office Hours: MW 9:00-10:30 Or by appointment

TA: **Kevin Fisher: fisher.645@buckeyemail.osu.edu Office hours to be announced**

Credit Hours: 3 Credit Hours

Pace of activities:

This course is divided into **weekly modules** that will include 2 lectures and 1 lab. Lab follows closely with lecture. This is a semester long course. Students are expected to keep pace with lab deadlines (most labs are due prior to the following lab session – some labs will span /multiple lab sessions) but may schedule their efforts freely within that time frame. If you fall behind due to technical issues, compensation for due dates will be made.

Credit hours and work expectations:

This is a 3-credit-hour course. According to Ohio State policy, students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average.

Prerequisites: None.

Textbooks/Readings:

Both the textbook and workbook are required. They are available in electronic form from the publisher.

LeBlanc, David C. Statistics: Concepts and Applications for Science. Edgewater FL: DLK Publishing, 2013.

Optional Readings: None are expected. But if there are supplemental readings for this course, they will be provided in the modules via carmen.

Additional Required Materials: Basic calculator will be needed for this course.

Other Fees or Requirements: None.

Course Description: This is an introductory data analysis course that focuses on understanding and applying basic statistical concepts, problem solving, and interpreting the results of statistical analysis. We will cover descriptive statistics, variability, correlation, regression, probability, the normal distribution and other sampling distributions, sampling, confidence intervals, hypothesis testing, t-tests, analysis of variance, Chi-square tests, interpretations of findings, presentation of findings, and applications to natural resources. You will gain exposure to Excel and R.

Goals: The overarching goal of this course is for students to develop skills in drawing conclusions and critically evaluating results based on data. We will achieve this goal by reaching the following 5 learning outcomes:

Learning Outcomes:

Learning Outcome 1 (LC1): Students will learn how to calculate and interpret fundamental descriptive and inferential statistics useful in the study and research of natural resources.

Learning Outcome 2 (LC2): Students will learn how to apply basic statistics to solving problems in the research and management of natural resources.

Learning Outcome 3 (LC3): Students will learn to read and understand the results section of a scientific article, including interpretation of figures, as it relates to the statistical tests covered in this class.

Learning Outcome 4 (LC4): Students will learn how to communicate descriptive and inferential statistical results in writing and through tables and figures.

Learning Outcome 5 (LC5): Students will learn to use Excel and R for data analysis.

This course meets a General Education requirement in Data Analysis. According to the OSU guidelines: "*Expected Learning Outcomes: Courses in Data Analysis develop students' 1.) Understanding of basic concepts of statistics and probability, 2.) Comprehension of methods needed to analyze and critically evaluate statistical arguments, and 3.) recognition of the importance of statistical ideas.* ***The main goal*** *for students will be to develop skills in drawing conclusions and critically evaluating results based on data." These outcomes will be achieved, and goals met through classwork, homework, lab assignments, and evaluated on exams.*

Course Technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at OCIO Help Hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** (http://ocio.osu.edu/selfservice)

- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Baseline Technical Skills for Online Courses

- Basic computer skills such as file structure, file types, and common functions such as copying, pasting, downloading, saving etc. will be needed. Additionally, web-browsing skills will also be necessary.
- Navigating Carmen: for questions about specific functionality, see the Canvas Student Guide.

Software Used

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Full instructions for downloading and installation is found https://ocio.osu.edu/kb04733.
- R-studio – Free https://rstudio.com/products/rstudio/download/
- Anydesk – an app that you can download to let instructor's help you with computer issues.

Carmen Access

You will need to use BuckeyePass multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass – Adding a Device help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click "Enter a Passcode" and then click the "Text me new codes" button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and the IT support staff will work out a solution with you.

Course Schedule:

Week-Date	Topics & Assignments	Associated Course Learning Outcome(s)
Week 1	What is Data and Where Does Data Come From? Chapter 1	The student will be introduced to the basic concepts of what data is, what data we will be using this semester and be able to identify data types. Also, they will learn the difference between a population and a sample.
Week 2	Exploratory Data Analyses. Chapter 2 – Lab 1 Introduction to Excel.	Students will learn how to calculate and interpret central tendency statistics as well as learn how to determine the spread of the data. Students will be able to identify patterns in data. In addition, they will have to demonstrate how to calculate central tendency measures (Mean, Median, and Mode) and know when each one is appropriate to use. Finally, each student will learn

		how to calculate spread in terms of variance, std. deviation, range, and IQR. From these they will complete graphical displays such as histograms, Boxplots, Modified Boxplots, Stem and Leaf Plots. Lastly, the student will be able evaluate probability distributions for skewness. Likewise, they will be able to evaluate central tendency variables to determine skewness.
Week 3	Probability. Chapter 3 – Lab 2 - Generating and Interpreting Figures and Tables	Students will now be able to define probability, random phenomena, and variables. Upon completion of chapter 3, a student will be able to evaluate the addition and multiplication rules of probability and differentiate between theoretical and empirical probabilities. Finally, the concept of the Law of Large Numbers will be defined.
Week 4	Finish Probability. Chapter 3 and begin Chapter 4 Probability dist.– Lab 3 Data Distributions in Tables and Charts	Students will learn how to identify when a binomial count is random, and develop a distribution function of such a variable. In addition, students will determine the probabilities of an expected outcome from a binomial distribution or the probability of a range of outcomes.
Week 5	The Normal Distribution: A Probability Distribution for Continuous Random Variables. Chapter 5–Lab 4 Review for Exam	Students will be able to determine when a random variable is continuous or discrete, determine the center, spread, and shape (distribution) pertinent to the variable. Students will also be able to construct a probability distribution curve, conduct a z-test, use a z-table to answer questions, and determine if data is normally distributed. Concepts of how sample statistics relate to population statistics will be demonstrated and reiterated in the homework and lab. Lab will be a review of exam material covering all topics to date.
Week 6	Review for exam – Lab 5 Introduction to R	The exam will cover all topics to date. In lab, RStudio will be introduced. Beginning coding will be given for students to complete.
Week 7	Exam week and Sampling Distributions Chapter 6 and 7 begin. Lab 6. Sampling Distributions with R	Students will be able to describe a sampling distribution in terms of spread shape and center for the sampling statistics for proportions and means. They will be able to differentiate between the null hypothesis and the alternative hypothesis. Type I and Type II errors will be defined.
Week 8	Sampling Distributions Chapter 6 and Hypothesis testing Chapter 7 Fall Break – No Lab	Students will be able to describe a sampling distribution in terms of spread shape and center for the sampling statistics for proportions and means. They will be able to differentiate between the null hypothesis and the alternative hypothesis. Type I and Type II errors will be defined.
Week 9	One and Two-Sample Tests for Proportions Chapter 8. Lab 7 - One sample z-test	One and two sample tests for proportions. Students will be able to compare sets of proportional data and determine if there is a significant difference between the samples and therefore the populations.

Week 10	One and Two Sample Tests for Sample Means Chapter 9. Lab 8 - Review for exam	Students will be able to identify when to use a one-sample t-test, paired t-test, two sample t-test, F-test, or Mann Whitney U-test. In addition, students will be able to identify when each test should be applied and how to organize these tests using the Null Hypothesis testing criteria. Lab will be a review of exam material covering all topics to date.
Week 11	REVIEW Lab 9 – On and Two Sample t-test	Lab 9 will cover one and two sample t-tests for data.
Week 12	Exam week and Tests for comparing two sample variances Chapter 10 and Tests for Comparing More Than Two Sample Means Chapter 11. Lab 10 - ANOVA	The exam will cover all topics since last exam however it will build upon previous concepts. In lab, we will continue with the use of RStudio. The students will learn when and how to use an ANOVA test using the hypothesis testing criteria.
Week 13	Chapter 10 & 11 continued. Lab 11 - Chi-square in RStudio.	The student will be brought back to the beginning of the semester when we examined data types. We will learn how to change data into count data and then how to perform Chi Square tests.
Week 14	Tests for comparing Two or More Sample proportions Chapter 12. No lab – Thanksgiving Break	Need some info here I think
Week 15	Tests for Association Between Two Quantitative Variables Chapter 13. Lab 12 - Linear Regression	Lastly, we will examine the relationship between two variables and how to evaluate this relationship. The student will learn about confounding variables.
Week 16	Review for final exam.	During these last two class periods, I clear up any misunderstood ideas. I draw a dichotomous chart of sorts looking at variables and situations to help students decide which test would be appropriate.

Instructor's policy on late or make up work:

Assignments are due at the beginning of class or lab period. Late assignments will result in a 10% reduction in possible points for each day the assignment is late. You must have email consent from the instructor to turn in assignments late without penalty. This must be dated before the assignment is due. Late assignments will only be accepted up to 7 days after the date for which the assignment was originally due.

If you will be unable to take an exam, arrangements to make up an exam must be made by email at least 3 days prior to the exam and be documented by email confirmation. If you miss an exam and have not made arrangements before the exam date you will not be able to make up the missed exam except in extreme circumstances with the approval of the professor.

Testing

Testing will be in person and will be closed note closed book with the EXCEPTION of a card handed out in lab. Anything you can write on this card can be used, BUT you can not use a printer to produce information for the card. For those with SLDS accommodations, SLDS will administer your exams.

Evaluation:

Task	Points % of Grade:
Weekly Laboratories	30%
Homework	20%
Participation	5%
Two mid-terms (12.5% each)	25%
Final Exam (Cumulative)	20%
TOTAL	100%

Assignment due dates and details will be posted in Carmen.

LAB ASSIGNMENTS:

You will submit all the required assignments through Carmen. They will be evaluated using a rubric. Grades and feedback will be available generally before the next lab is due.

HOMEWORK:

Homework will be done on 8.5 by 11 inch paper and must be legible. All homework will be handed in during class. There is a box outside my office (375 C Kottman Hall) to place homework in if you are unable to make class.

EXAMS:

The midterms and final will be held during class times or as scheduled with the OSU registrar (https://registrar.osu.edu/scheduling/SchedulingContent/AU21Finals.pdf). Both the midterms and final exam are closed book (with exception of the card) and must be completed without any external help or communication. They consist of fill in the blank (a word bank with the answers as well as some additional words will be provided), short answer questions such as specific definitions, and 2 to 3 discussion questions. The midterms are designed to take 55 minutes while the final is designed to be 1 hour and 45 minutes.

ASSIGNMENT	POINTS (MAY CHANGE)	PERCENTAGES
Lab 1 – Introduction to Excel	125	2990 points 30%
Lab 2 – Generating and Interpreting Figures and Tables	210	
Lab 3 – Data Distributions using Tables and Charts	230	
Lab 4 – Review for Exam – No late submissions accepted for this lab	385	
Lab 5 – Introduction into R	255	
Lab 6 – Sampling Distributions with R	130	
Lab 7 – One sample Z-test with R	255	

Lab 8 – Review for Exam – No late submissions accepted for this lab	330	
Lab 9 – One-sample T-test with R and Hypothesis Testing	240	
Lab 10 – Two Sample T-test with R.	305	
Lab 11 – Chi-square and Anova in R.	255	
Lab 12 – Linear Regression	270	
Homework 1 -Chapter 1 and 2	210	1460 points 20%
Homework 2 -Chapter 3	200	
Homework 3 -Chapter 5	200	
Homework 4 -Chapter 6 and 7	240	
Homework 5 -Chapter 9	240	
Homework 6 -Chapter 11	130	
Homework 7 – Chapter 12 homework	240	
Participation	100	5 %
Exam 1	200	12.5%
Exam 2	200	12.5%
Final Exam	400	20%
Total	**5350**	**100%**

Grading Scale:

Percentage	Grade	Percentage	Grade
93-100	A	73-76.9	C
90-92.9	A-	70-72.9	C-
87-89.9	B+	67-69.9	D+
83-86.9	B	60-66.9	D
80-82.9	B-	<60	E
77-79.9	C+		

COURSE POLICIES

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. Email is my preferred contact method. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

- **Grading and feedback:** For each lab assignment you should receive feedback by the next class period, but no later than 2 class periods.
- **E-mail:** I will reply to e-mails within generally within 24 hours, but for urgent questions, please text me 614-495-6738 between the hours of 7:00 am and 10:00 pm. Most questions are computer related and will require me to use teamviewer to access your screen. From here I will be able to answer your question and get you going again.

Attendance Policy:

You are required to be present for lab. Lectures will be recorded and posted to Carmen. Labs will be recorded, but you are required to attend lab unless you have notified me prior to lab. **Unexcused lab absences will result in a 25% reduction in the lab assignment**. If you are facing extenuating circumstances, please reach out to me as soon as possible.

- **Office hours and live sessions**: ***LABS ARE THE ONLY MADATORY ATTENDANCE. SEE ABOVE***
  All lectures and office hours, are optional.

E-Mail Etiquette:

- Include a descriptive statement in the subject line.
- Use proper salutations when beginning an e-mail.
- Be concise in the body of the e-mail, use complete sentences and proper grammar.
- Use an appropriate closure at the end of each e-mail followed by your first and last name.
- If replying to an e-mail, reference the original e-mail and its content.
- Be selective of your choice of words. Emotions are difficult to convey in text and without the benefit of facial expressions your sentiment can be lost in the words you choose to write.

<u>DON'T</u>

- Use all capital letters; this conveys a tone of ANGER.
- Use e-mail as a format to criticize other individuals.
- Ask for your grade via e-mail. Grades will not be discussed by e-mail. If you need to discuss a graded item make an appointment with me.
- E-mail to inquire when grades will be posted. We will work toward submitting grades promptly, however, recognize that grading assignments and exams requires considerable time to ensure uniformity and fairness.
- Send an e-mail out of frustration or anger. Learn to save the e-mail as a draft and review at a later time when emotions are not directing the content.

TEXT Etiquette:

- Include your name, OS you are using, and the assignment you are working on.
- Be concise.
- And try NOT to let auto-text corrections mislead your message.
  For example, GPS is auto corrected to GOD. Sometimes this will slip by, just correct in subsequent message.

Quizzes and exams:

You must complete the midterm and final exam yourself, without any external help or communication.

Written assignments:

There will be a series of lab assignments due for this class. The format for these will be given in class. Please have a journal article from your profession to use as reference for how you will format tables, figures, and literature cited.

Reusing past work:

In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.

Falsifying research or results:

All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.

UNIVERSITY POLICIES see: https://ugeducation.osu.edu/faculty-and-staff-resources for current versions.

Religious accommodations:

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct at Student Life http://studentconduct.osu.edu.

Ohio State's academic integrity policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's *Code of Student Conduct*, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's ***Code of Student Conduct*** (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination.

Ignorance of the University's *Code of Student Conduct* is never considered an "excuse" for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages (COAM Home)
- *Ten Suggestions for Preserving Academic Integrity (Ten Suggestions)*
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Intellectual Property (covered by copyright) includes Course materials (Text, Audio, Video, Multimedia, Sims, Apps, etc.), and Student Generated materials

Disability Services

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodation so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Diversity:

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential.

Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Requesting accommodations

If you would like to request academic accommodations based on the impact of a disability qualified under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, contact your instructor privately as soon as possible to discuss your specific needs. Discussions are confidential. In addition to contacting the instructor, please contact the Student Life Disability Services at 614-292- 3307 or ods@osu.edu to register for services and/or to coordinate any accommodations you might need in your courses at The Ohio State University.
Go to Office of Student Life - Disability Services for more information.

UNIVERSITY RESOURCES

Counseling and Consultation Services:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or
at suicidepreventionlifeline.org.