SYLLABUS

FORS201 – Forest Biometrics
WA Franke College of Forestry
Autumn 2021

About the course

Forest Biometrics focuses on the development and application of statistical methods to advance the ecological sciences and the stewardship of forest resources. For example, biometricians undertake the design and analysis of silvicultural field experiments, of ecological surveys, and of observational studies of environmental impacts – all activities central to both the theory and practice of forestry and natural resources conservation. Forest ecologists and environmental scientists, for example, need rigorously-designed field studies to test and expand scientific theories relating to plant community dynamics, fuels treatment effectiveness, or climate change impacts. Foresters and natural resource managers likewise need accurate, data-driven depictions of the ecological resources they manage, and of how they may be impacted by management and conservation practices under consideration.

This course will introduce you to modern empirical methods for forestry and the natural resource sciences, and will give you a grounding in the concepts and techniques used for data collection, data analysis, probabilistic reasoning, and inferential statistics. You'll have the opportunity to apply statistical methods – ranging in scope from descriptive graphical and quantitative analyses to formal probabilistic assessments and regression models – to real-world problems. You'll also build and apply critical thinking skills as they relate to data-driven inferences in scientific and management applications.

Course learning outcomes

By the end of this course you will:

1. Recognize the ubiquity and importance of variation in natural systems and the consequent need for statistical reasoning.
2. Be able to effectively summarize data to characterize central tendency, variation, relationships and other important distributional features of natural resource data.
3. Appreciate the role of randomization in data collection and statistical inference.
4. Understand the concept of sampling distributions, and the utility of the Central Limit Theorem.
5. Be familiar with probability distributions commonly used in statistical inference.
6. Apply appropriate statistical methods to characterize uncertainty, to measure evidence in support of hypotheses, and to make quantitative predictions.

Course prerequisites

This is not a mathematics course but you will apply mathematical concepts and equations. Thus a mathematics course at or above the level of M115 (Probability and Linear Math) is required.

Instructors

Professor David Affleck
C.H. Clapp Building (CHCB) 430
david.affleck@umontana.edu

Enzo Paolo Martelli Moya
C.H. Clapp Building (CHCB) 460
enzo.martellimoya@umontana.edu

Office hours
- **Thursdays 2:30 – 4:00 pm on Zoom**
  Meeting ID: 974 6536 4845
  Passcode: 353500
- **in person by appointment**

Office hours TBD

Course format

This course is currently scheduled for live, face-to-face instruction – at this time it is not available as a remote or online course but we will adapt as necessary. Course materials, online activities/readings/videos, assignments, and announcements will be posted on the FORS201 Moodle website accessible from moodle.umt.edu. To be successful in the course you'll want to attend the in-person lecture sessions and stay current with the online materials.

Lecture meetings will take place either under the tent above the North Underground Lecture Hall, or in the Social Sciences building room 352. My preference is to use the outdoor setting as long as the weather permits.

Lab meetings will take place in the Stone Hall computer labs (Stone Hall rooms 106 & 107).

Monday lab section (CRN 71979) M 10:00 – 11:50 am	Wednesday lab section (CRN 71980) W 12:00 – 1:50 pm

The labs consist of assignments focusing on applications of the material introduced in lectures and in online activities. They involve data analysis, problem solving, and computing exercises. New lab assignments will be accessible at the start of each lab period and due before the subsequent lab (i.e. in one week's time), unless otherwise noted. Group work is strongly encouraged in labs but every student must submit their own work.

Materials

There is no required textbook for the course, but links will be provided to further reading, interactive simulations, and additional exercises from the Online Learning Initiative (OLI) "Statistical Reasoning" resources and activities. These web-based materials are freely accessible and can be accessed with or without signing up for an OLI account. They can also be accessed across a range of devices and browsers.

Assessment

The course uses 3 types of assessments:

1. Repeatable online quizzes posted continuously throughout the semester
2. Laboratory assignments posted each week
3. Non-repeatable unit exams (3 in total)

The online quizzes make up 10% of the final grade, the laboratory assignments 50%, and the unit exams will cover the remaining 40%. The quizzes and exams will draw on material covered in class and in labs. Traditional letter grades will be assigned based on the combined percentage grade:

A	≥ 80%
B	79-70%
C	69-60%
D	59-50%
F	<50%

Note that the class is offered for traditional letter grade only.

Miscellanea

Per university policy, all electronic communication associated with the course must be sent to University of Montana email accounts. Ensure that your umconnect.umt.edu email is properly configured and active!

All course activities are governed by the Student Conduct Code, which embodies the ideals of academic honesty, integrity, human rights, and mutual respect. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code.

The University of Montana assures equal access to instruction. If you anticipate or experience barriers based on disability, please contact the Office for Disability Equity (ODE) at 406-243-2243 or ode@umontana.edu. As your instructor, I will work with you and the ODE to seek effective accommodation, and you are welcome to contact me privately if you wish.

Note that UM's face covering policy requires masks in classrooms and computer laboratories, and strongly recommends masks in all other indoor settings. Please view this as a precautionary measure taken out of respect for others. Also, to allow for contact tracing, the University requires us to maintain seating charts and attendance. These activities will be handled through Moodle and will be part of the online quizzes assessment component. That is, you will receive credit for completing them, even where you are simply marking yourself as absent.

Preliminary course outline

Week	Topics and important dates
Aug 30	Course overview; structure of data and classification of variables; tabular & graphical analysis of categorical variables
Sept 6	Analysis of quantitative variables: histograms; measuring central tendency • Monday is Labor Day – no lecture or lab meeting on Monday, Sept. 6
Sept 13	Characterizing variation: interquartile range and standard deviation Ranks, percentiles, standardizations, and standard scores • Sept. 15 is the last day that courses can be dropped on Cyberbear with a refund
Sept 20	Bivariate relationships: visualizing, characterizing, and quantifying strength
Sept 27	Linear regression: finding the line of best fit for description and estimation.
Oct 4	Sampling principles and sampling designs: random, systematic, stratified
Oct 11	Study design: Comparative experiments and observational studies
Oct 18	Introduction to probability and random variables
Oct 25	The normal or Gaussian distributions
Nov 1	Sampling distributions and the Central Limit Theorem • Dropping fall classes after Sept. 15 but before Nov. 2 requires instructor and advisor approvals; you will receive a 'W' on your transcript and no refund. After Nov. 2, classes can be dropped only under limited and unusual circumstances and will require approvals from instructor, advisor, and Associate Dean.
Nov 8	Introduction to interval estimation; confidence intervals for population proportions and means
Nov 15	Introduction to significance testing: mechanics, test statistics, critical values and p-values
Nov 22	Significance tests of population proportions • Thanksgiving break Nov 24-26; no lecture or lab meetings on these days
Nov 29	Significance tests of population means
Dec 6	Advanced topics (tests of independence, regression inference, ANOVA); course review • Classes end on Dec 10
Dec 13	Exam week - no classes or lab meetings this week • Last unit exam from 8 – 10 am on Tuesday, December 14th

Preliminary Lab Schedule (check Moodle for latest updates)

Lab	Topic	Monday lab group	Wednesday lab group
1	Introduction to Microsoft Excel (and the computer labs)	Aug 30	Sept 1
2	Describing and interpreting data distributions	Sept 13	Sept 8
3	Quantifying distributional features	Sept 20	Sept 15
4	Creating and interpreting scatterplots and correlation	Sept 27	Sept 22
5	Linear regression	Oct 4	Sept 29
6	Applied sampling	Oct 11	Oct 13
7	Analysis of observational and experimental designs & data	Oct 18	Oct 20
8	Applications of probability	Oct 25	Oct 27
9	Working with the normal distributions	Nov 1	Nov 3
10	Sampling distributions: applying the central limit theorem	Nov 8	Nov 10
11	Confidence intervals	Nov 15	Nov 17
12	Mechanics of significance testing	Nov 29	Dec 1
13	Significance testing of population proportions & means	Dec 6	Dec 8