SYLLABUS

FORS201 – Forest Biometrics
WA Franke College of Forestry
Autumn 2020

About the course

Forest Biometrics focuses on the development and application of statistical methods to advance the ecological sciences and the conservation of forest resources. The design and analysis of silvicultural field experiments, of ecological surveys, and of observational studies of environmental impacts are all examples of endeavors undertaken by biometricians. Moreover, they are examples of activities that are 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 the 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 and to build 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
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Office hours
- Fridays 2 – 3:30 pm on Zoom
  Meeting ID: 969 5505 4752
  Passcode: 2020201
- in person by appointment

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Office hours TBD

Course format

This course will be available remotely and will consist of a mix of live meetings and online, asynchronous activities. Course materials, assignments, and announcements will be posted on the FORS201 Moodle website accessible from moodle.umt.edu.

Lectures will be streamed live on Zoom on the following schedule

Lecture section (CRN 72262)
MWF 9:00 am on Zoom Meeting ID: 951 7972 2399 Passcode: 2020201

The lecture meetings will also be recorded and posted on Moodle along with other online activities/readings/videos that can viewed and completed asynchronously. To be successful in the course you'll want to connect for the streamed lecture sessions and stay current with the online materials.

Lab meetings will take place live via Zoom using the links below, as well as in the Stone Hall computer labs (Stone Hall rooms 106 & 107) for those who want to use on-campus resources.

Monday lab section (CRN 72263)	Wednesday lab section (CRN 72264)
M 10:00 – 11:50 am by Zoom link or in Stone Hall 106 & 107 Meeting ID: 948 4721 0648 Passcode: 2020201	W 12:00 – 1:50 pm by Zoom link or Stone Hall 106 & 107 Meeting ID: 980 5650 1677 Passcode: 2020201

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 his or her 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's "Probability & Statistics" resources and activities. These materials are freely accessible and can be accessed with or without signing up for an OLI account.

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 will 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.

Students with disabilities may request reasonable modifications by contacting the instructor. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS).

Those using the Stone Hall computing labs will want to bring a set of headphones to access online/streaming course content.

Note that UM's face covering policy will apply in the computing labs, as in any partially enclosed spaces or spaces in which social distancing cannot be maintained. Please view this as a precautionary measure taken out of respect for others.

Preliminary course outline

Week	Topics and important dates
Aug 17	Course overview; structure of data and classification of variables • Classes begin Wednesday, Aug. 19 • No lab meetings this week
Aug 24	Tabular & graphical summaries of categorical variables; measuring central tendency
Aug 31	Characterizing variation: interquartile range and standard deviation Ranks, percentiles, standardizations, and standard scores
Sept 7	Bivariate relationships: visualizing, characterizing, and quantifying • Monday is Labor Day – no lecture or lab meeting on Monday, Sept. 7 • Sept. 9 is the last day that courses can be dropped on Cyberbear with a refund
Sept 14	Linear regression: finding the line of best fit for description and estimation.
Sept 21	Sampling designs: random, systematic, stratified
Sept 28	Study design: Comparative experiments, observational studies, and sample surveys.
Oct 5	Introduction to probability and random variables
Oct 12	Probability distributions, expected values, and standard errors.
Oct 19	Some useful probability distributions: the binomial and normal (Gaussian) distributions. • Dropping fall classes after Sept. 9 but before Oct. 21 requires instructor and advisor approvals; you will receive a 'W' on your transcript and no refund. After Oct. 21, classes can be dropped only under limited and unusual circumstances and will require approvals from instructor, advisor, and Associate Dean.
Oct 26	Sampling distributions and the Central Limit Theorem
Nov 2	Introduction to significance testing: mechanics, test statistics, critical values and p-values
Nov 9	Introduction to interval estimation; confidence intervals for population proportions and means • Wednesday, Nov. 11, is Veterans' Day – no class or lab meeting on Wednesday.
Nov 16	Advanced topics (tests of independence, regression inference, ANOVA); course review • Classes end on Nov 18 – no class meeting on Friday, Nov. 20.
Nov 23	Exam week - no classes or lab meetings this week • Last unit exam from 8 – 10 am on Wednesday, November 25th

Initial 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 24	Aug 26
2	Describing and interpreting data distributions	Aug 31	Sept 2
3	Quantifying distributional features	Sept 14	Sept 9
4	Creating and interpreting scatterplots and correlation	Sept 21	Sept 16
5	Linear regression	Sept 28	Sept 23
6	Study design and sampling concepts	Oct 5	Oct 7
7	Working with probability concepts and models	Oct 12	Oct 14
8	Applications of the binomial distribution	Oct 26	Oct 21
9	Applications of the normal distribution	Nov 2	Oct 28
10	Sampling distributions: applying the central limit theorem	Nov 9	Nov 4
11	Confidence intervals & significance testing	Nov 16	Nov 18