

Prerequisites: Stat 217, 332, 401 or equivalent course in statistics.

Textbook: *Sampling: Design and Analysis*, 2nd Edition, by Sharon Lohr. Brooks/Cole.

Instructor: John Borkowski

Phone: 994-4606

Class Room: Wilson 1-144

Class Time: M W F 1:10-2:00

Office: 2-263 Wilson

Office Hours: M 2:00-3:00, Tu 12:00-1:00, W 11:00-12:00

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Computing: The *SAS* and *R* statistical computing packages will be used throughout the course. Computer simulations will be included to study the strengths and weaknesses of competing sampling procedures. Computer-related code and output can be downloaded from the course webpage.

Topics

- Introduction
 - Target vs study populations, sampling frame, sampling units.
 - Sampling and nonsampling errors.
- Simple random sampling
 - Estimation of the population mean and total
 - Confidence intervals for the population mean and total
 - Sample size determination
 - Estimating proportions
- Stratification
 - Stratified simple random samples
 - Proportional and optimum allocation of stratum sample sizes
 - Attribute and ratio estimation in stratified populations
 - Bootstrap estimation
- The Bootstrap Method
 - The bootstrap estimate of the standard error and bias
 - Bootstrap confidence intervals
- Ratio and Regression Estimators
 - Ratio estimators of the population mean and total (with CIs)
 - Regression estimators of the population mean and total (with CIs)

- Cluster and Systematic Sampling
 - One-stage cluster sampling with equal and unequal sized clusters
 - Systematic sampling
 - Cluster sampling with probability proportional to size
 - Two-stage cluster sampling
- Multistage Sampling
 - Multistage sampling involving combinations of simple random sampling, stratified sampling, and systematic sampling.
- Unequal Probability Sampling
 - Hansen-Hurwitz estimators
 - Horvitz-Thompson estimators
- Distance Sampling
 - Estimating detectability
 - Density estimation methods using line transect sampling
 - Designs for selecting line transects (e.g., random, systematic)
 - Variable circular plots, point transects, and other methods
- Other Topics (as time permits)
 - Capture-recapture sampling, double sampling, questionnaire survey design, ...

Grading:

Midterm Exam (40 points inclass, 40 points takehome)

Final Take-Home Exam (40 points)

Final Project (40 points)

Homework Assignments (\approx 100-150 points)

Final Project

- You will propose a sample survey either by yourself or with one partner. This proposal will include a description of the sampling plan, response(s) of interest, and the objectives of the study. Your proposed design and analysis should be more complex if collaborating with a partner. The proposal is to be submitted no later than two weeks before the final exam date. I will be available for discussion and/or consultation regarding the problem you choose.
- I will review the proposal. At this point, I may or may not have comments and suggestions. Once I inform you that your proposal is acceptable, you will do the following
 - Collect the sample for the sampling units selected from your design.
 - Analyze the data.
 - Interpret the results. Prepare a report on your findings.