Fall 9-1-2000

# MATH 549.01: Applied Sampling

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# MATH 549 Applied Sampling Fall, 2000


**Instructor**: Jon Graham
Math 202
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**Time**: Mon, Wed, Fri, 1:10-2:00am

**Room**: Math 103

**Textbook**: Sampling / Thompson

**Office Hours**: To be announced, By appointment

**Course Webpage**: http://lennes.math.umt.edu/~jgraham/math549/math549.html

**Grading**:

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|---|---|
| Homework: | 30% |
| Exams 1,2: | 40% |
| Final Project: | 30% |

**Prerequesites**: MATH 441 or 444 or consent of instructor

**Homework** will be assigned every one or two weeks, to be handed in one or two weeks depending on length. I will accept one late homework, and the lowest homework grade will be dropped. Homework is not only a fairly substantial portion of your grade, but is vital to your success in this class. Working with other students on homework is allowed and even encouraged, so long as you hand in your own work, and do not simply copy someone else's work. On problems requiring computer output, please hand in only that output relevant to the questions asked. Solutions to all problems will be provided.

**Exams 1 & 2** will be cumulative and closed book. More about the exams, including the exact dates of the exams will be given later. If you cannot make it to an exam, you must let me know BEFORE the exam is given. No make-up exams will be given without a documentable reason for missing the exam.

The **Final project** consists of both a written and oral component. The oral presentations will be made the final week of class and during the final exam week, and the written reports are due on the final exam date, December 21. The projects should be of one of the following types:

1. Presentation and an application (carried out by you) of a sampling methodology which has not been discussed in class. A good source of papers discussing new sampling techniques, particularly in biology, is the journal *Biometrics*.

2. Development of a sampling design for a project (e.g. thesis) which you will be carrying out. You must be very specific and have enough information to develop an effective design.

3. Analysis of data you have already collected from a study you are involved in.

4. Evaluation of a sampling method or comparison of two or more sampling methods in a small-scale field test to see how theory translates into reality. This will involve several replications of each method.

**Course Material and Objectives**: This course provides both the theory and application of methodology for selecting samples from populations to efficiently estimate parameters of interest. Some sampling methods covered are simple random, systematic, cluster, stratified, multistage, line transect, distance, adaptive, and spatial sampling. The focus of the course will be jointly on the application of these sampling techniques and

the theory governing them. The computer package Splus will be used throughout the course both in class and in homework assignments.

**Additional Course Information**:

The last day to add or drop this course by phone is Monday, September 25.
The last day to add or drop this course or change the grading option is Monday, October 16.

Questions are strongly encouraged, both during class and at office hours. If you are lost or confused, please let me know.

## Summary of Topics

1. Overview of Sampling Designs (Chapter 1)
   (a) Sampling Units, Populations, Sampling plans
   (b) Sampling Distributions, Bias, Variance, MSE
2. Basic Sampling - Estimation of Means & Totals (Chapters 2-6)
   (a) Simple Random Sampling
   (b) Confidence Intervals
   (c) Sample Size Determination
   (d) Estimating Proportions and Ratios
   (e) Unequal Probability Sampling
3. Auxiliary Information in Sampling (Chapters 7, 8)
   (a) Ratio Estimation
   (b) Regression Estimation and Models
4. Other Sampling Designs (Chapters 11-14)
   (a) Stratified Sampling
   (b) Cluster Sampling
   (c) Systematic Sampling
   (d) Multistage Designs
   (e) Double Sampling
5. Detectability Methods (Chapters 16, 17)
   (a) Dectectability and Sampling
   (b) Line Transects
6. Spatial Sampling (Chapters 20, 21)
   (a) Kriging (Spatial Prediction)
   (b) Spatial Designs
7. Adaptive Sampling (Chapters 23-26)