

# STATISTICS 410-3

## STATISTICAL ANALYSIS OF SAMPLE SURVEYS

Summer 2001  
DAY COURSE

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Instructor: B. MCNENEY

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### Prerequisite:

STAT 330 (or MATH 372) or permission of the instructor. Students with credit for MATH 304 may not take STAT 410 for further credit.

### Textbook:

*Sampling Design and Analysis* by Sharon Lohr, published by Duxbury Press.

### Calendar Description:

An introduction to the major sample survey designs and their mathematical justification. Associated statistical analyses.

### Outline:

This course develops the statistical theory required for constructing and analyzing complex sample surveys. Applications to be discussed may include e.g., the Gallup Poll, market surveys, the Canadian Labour Force Survey, and forest surveys.

1. **The Role of Randomization in Sample Surveys:** Bias, standard error, and root mean squared error, survey terminology.
2. **Simple Random Sampling:** Using random number generators and tables to take a simple random sample, the sampling frame, estimating means, totals, and proportions, the finite population correction factor, confidence limits, problems with the use of the normal approximation, choosing the sample size.
3. **Stratified Random Sampling:** Advantages of stratification, estimating gains in precision, confidence limits, optimal sample sizes, effects of errors in calculated stratum sizes and in optimal allocation, stratification after selection.
4. **Ratio and Regression Estimates:** Purpose and examples, bias, standard error, confidence limits, optimal conditions, optimal allocation, weak dependence on usual regression assumptions.
5. **Systematic Sampling:** A brief survey of the models required to estimate the variance, and of potential advantages and disadvantages.
6. **Cluster and Multi-Stage Sampling:** Purpose and examples, comparison estimators, equal- vs. unequal-probability sampling, optimal choice of sampling fractions and probabilities.
7. **Double Sampling:** An overview of the role of double sampling in constructing stratified, ratio, and regression estimates; sampling on two or more occasions.

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### Grading

Homework - 20%  
Midterm - 30%  
Final - 50%

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*Students should be aware that they have certain rights to confidentiality concerning the return of course papers and the*