

Methods And Theory Of Sample Design
SURVMETH 617 (STATISTICS 580/BIOSTATISTICS 617/SOCIOLOGY 717)
SURV 440
Fall, 2011

INSTRUCTOR

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CLASS MEETINGS

1:00-2:30 PM Monday & Wednesday
Ann Arbor, MI: G300 ISR-Perry; College Park, MD: 1208 Lefrak Hall

OFFICE HOURS

Chat room on CTools, by Skype, or by appointment

COURSE CONTENT

Methods and Theory of Sample Design is concerned with the theory underlying the methods of survey sampling widely used in practice. It covers the basic techniques of simple random sampling, stratification, systematic sampling, cluster and multi-stage sampling, and probability proportional to size sampling; methods of variance estimation for complex sample designs, including the Taylor series expansion method, balanced repeated replications, and jackknife methods; and several specialized topics, including stratification and subclasses, multi-phase or double sampling, ratio estimation, selection with unequal probabilities without replacement, non-response adjustments, imputation, and small area estimation. The course examines both the practical applications of the sampling techniques presented as well as the theory supporting the methods.

COURSE ORGANIZATION, HOMEWORK, EXAMINATIONS, AND GRADING

The course meets twice per week, starting at 10 minutes past the hour (1:10 AM) and ending at 2:30 PM. Class time is devoted to lecture and discussion of homework and examination problems. Questions during lectures are welcomed.

Course materials are on the course web site, including lecture notes, homework problems, and readings. The first three lecture notes sections will be distributed in class; students are responsible for printing copies of other sections. Other materials will not be copied and distributed in class.

Homework assignments are assigned in the syllabus below, and are due on the date indicated. The instructor leads a CTools chat room session the Monday evening before each homework assignment is due, usually 7:00-8:00 PM; the instructor will announce any changes in the chat room schedule in class the week before the assignment is due. Homework assignments are graded on a 100 point scale.

There are two open-book open-notes in-class examinations, a mid-term and a final. Each cover all material discussed previously in the course. Students bring calculator to the examinations. There is a chat room session scheduled the evening before the midterm exam.

The final grade for the course is an average of homework and examination grades: final examination contributes approximately 40%, the midterm examination 30%, the homework 30% grade.

Regular attendance and participation in this class is the best way to grasp the concepts and principles being discussed. However, in the event that a class must be missed due to an illness, the policy in this class, following University of Maryland guidelines, is as follows:

- For every medically necessary absence from class, a reasonable effort should be made to notify the instructor in advance of the class. When returning to class, students must bring a note identifying the date of and reason for the absence, and acknowledging that the information in the note is accurate.

- If a student is absent more than 6 times, the instructor may require documentation signed by a health care professional.
- If a student is absent on days when tests are scheduled or papers are due he or she is required to notify the instructor in advance, and upon returning to class, bring documentation of the illness, signed by a health care professional.

ACADEMIC CONDUCT

The faculty of the University of Maryland and University of Michigan expects the conduct of a student registered or taking courses in the university to be consistent with that of a professional person. Courtesy, honesty, and respect should be shown by students toward faculty, guest lecturers, administrative support staff, and fellow students. Similarly, students should expect faculty to treat them fairly, showing respect for their ideas and opinions and striving to help them achieve maximum benefits from their experience in the school.

Student academic misconduct includes plagiarism, cheating, fabrication, falsification of records or official documents, intentional misuse of equipment or materials, and aiding and abetting the perpetration of such acts. The preparation of reports, papers, and examinations assigned on an individual basis must represent each student's own effort. Reference sources should be indicated clearly. The use of assistance from other students or aids of any kind during a written examination, except when the use of books or notes has been approved by an instructor, is a violation of the standard of academic conduct.

COURSE EVALUATION

Both the University of Maryland and University of Michigan have moved to online course evaluations. All students are strongly urged to use the respective university online course evaluation system at the end of the term. Course evaluations will only be available to other students when at least 70% of registered students complete the evaluation. Thus, it is very important that all students log on toward the end of the semester to complete a course evaluation.

TEXTBOOKS

There are two main texts for the course. References to other texts may be made from time to time. *Sampling Techniques, 3rd ed.*, by William G. Cochran (J. Wiley and Sons, Inc., New York, 1977). *Survey Sampling* by Leslie Kish (J.W. Wiley & Sons, New York, 1965).

ONLINE READINGS

- (1) Kish, L. "Selection With Probabilities Proportional to Size Measures," Chapter 7 in *Survey Sampling*, pp. 217-247. New York: Wiley and Sons, 1965.
- (2) Kish, L. "Techniques for Computing Variances," Section 8.6 in *Survey Sampling*, pp. 282-293. New York: Wiley and Sons, 1965.
- (3) Kish, L. "Biases and Nonsampling Errors," Chapter 13 in *Survey Sampling*, pp. 509-571. New York: Wiley and Sons, 1965.
- (4) Rust, K, and Rao, J.N.K. "Variance Estimation for Complex Surveys Using Replication Techniques," *Statistical Methods in Medical Research*, Vol. 5, 1996, pp. 283-310.

COURSE SYLLABUS

Date	Topic	Readings ^a	Homework ^b
Sept 7	Course introduction. Statistical tools.	C 1; K 2.0-2.2	--
12	Simple random sampling.	C 2; K 2.3-2.5	-- ^{Chat}
14	Simple random sampling. ^c	C 3; K 2.6-2.9	Homework 1
19	Simple random sampling. Stratification.	C 4; K 3.1-3.3	-- ^{Chat}
21	Stratified sampling. ^c	C5	Homework 2
26	Stratified Sampling.	C 5A; K 3.4-3.5	-- ^{Chat}

28	Stratified Sampling.	--	Homework 3
<i>Oct</i> 3	Stratified Sampling	--	-- ^{Chat}
5	Stratified Sampling. ^c	--	Homework 4
10	Stratified Sampling	--	-- ^{Chat}
12	Stratified Sampling. Cluster sampling. ^c	C 9; K 5.1-5.2	Homework 5
17	No class: Michigan Fall Break.	--	--
19	Cluster sampling.	--	--
24	Midterm exam ^{Chat}	--	--
26	Systematic sampling. ^c	C 9A; K 6.1-6.3	--
31	Systematic sampling. Two stage sampling.	C8; K 4.1-4.2	--
<i>Nov</i> 2	No class: Two stage sampling.	C 10; K 5.3-5.4	--
7	Unequal sized cluster sampling I.	C9A; K6.1-6.3	--
9	Ratio estimation. ^c	C6; K 6.6,6.12	--
14	Unequal sized cluster sampling II.	C 11; K 6.4	-- ^{Chat}
16	Probability proportionate to size sampling. ^c	K7.1-7.5	Homework 6
21	Probability proportionate to size sampling.	--	-- ^{Chat}
23	Sampling errors for non-linear statistics.	C 11; K 4.3-4.4	Homework 7
28	Sampling errors for non-linear statistics.	K 8.6	-- ^{Chat}
30	Unequal probability w/o replacement. ^c	C 11	Homework 8
<i>Dec</i> 5	Double sampling.	C 12; K 12.1	-- ^{Chat}
7	Unit non-response. ^c	C 13	Homework 9
12	Weighting and other compensation.	K 13.1-13.3	--
21	Final exam; 1:30-3:30 PM.	--	--

^a Refers to sections of Cochran (C) or Kish (K) which should be read before the class session.

^b Assignment due at the beginning of the indicated class period. All problems are from Cochran or handouts distributed at least one week before the assignment is due.

^c Instructor at JPSM, 1208 Lefrak Hall, University of Maryland

^{Chat} Chat room sessions are Monday evenings before homework is due, 7:00-8:00 PM, unless specified otherwise. For example, the chat room session for the first homework is Monday, September 12, 7-8 PM.

