

**SURV 625**  
Applied Sampling  
Spring 2012

**SURVMETH 612**  
Methods of Survey Sampling  
Winter 2012

### **CLASS MEETINGS**

1:00-4:00 PM, Wednesdays  
Room 1208 Lefrak, University of Maryland, College Park, Maryland  
Room G300 ISR-Perry, University of Michigan, Ann Arbor, Michigan  
T10, US Census Bureau, Suitland, Maryland

### **INSTRUCTORS**

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### **ASSISTANTS**

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### **OFFICE HOURS**

By appointment. See also the 'Chat Room' schedule.

### **COURSE CONTENT**

Methods of Survey Sampling/Applied Sampling is an applied statistical methods course, but differs from most statistics courses, though, because it is concerned almost exclusively with the *design* of data collection. Little of the analysis of collected data will be discussed in the course. The course will concentrate on problems of applying sampling methods to human populations. The principles can be applied, though, to many other types of populations.

The course is presented at a moderately advanced statistical level. While we will not develop mathematical aspects of sampling theory, statistical notation and outlines of some algebraic proofs will be given. A sound background in applied statistics is necessary, since a few algebraic derivations will be presented. Little emphasis will be placed on the derivations. Nonetheless, a thorough understanding of the notation and results will be needed.

The aims of the course are to teach basic ideas of sampling from an applied perspective and to provide experience with life-like problems. The course will cover the main techniques used in sampling practice: simple random sampling, stratification, systematic selection, cluster sampling, multistage sampling, and probability proportional to size sampling. These methods

will be examined further in the context of two particular types of sample designs, area sampling and telephone sampling. The course will also cover sampling frames, cost models, sampling error estimation techniques, non-sampling errors, and compensating for missing data.

## **COURSE LOGISTICS**

The course will be simultaneously transmitted via video among the Joint Program in Survey Methodology at the University of Maryland (Lefrak Hall), the Institute for Social Research at the University of Michigan (Perry Building), and the US Census Bureau in Suitland, Maryland. The three-way interactive audio-video system allows those at the transmitting site and those at the remote sites to see and hear those at the transmitting and other remote site. Approximately one-third of the class sessions will be taught in College Park or Suitland, Maryland. The remaining sessions will be taught from the University of Michigan and transmitted to the other sites.

Class sessions are once each week at 1:10 PM Wednesday, with one 10 minute break. Class ends at 4:00 PM. If it is necessary to cancel a class session due to a university closing, students will be notified via the course web site email tool. All class sessions will be video recorded for later viewing by students, and access instructions provided via the course web site.

All registered students will have access to the course web site through registration (at the University of Michigan) or guest log in (for University of Maryland and Census Bureau students). The web site contains lecture notes, homework problems, homework solutions, readings, the course project, an email log, and the chat room. Materials posted on the web site will not be distributed on paper in class, except the first class session when paper copies of the syllabus, lecture notes, and homework problems will be distributed.

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 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.

While the instructors acknowledge the University of Maryland policy, we will not require a note following each absence. Instead, as a courtesy to the instructors, students must notify both instructors via email beforehand that they will miss a class session.

## **HOMEWORK**

Homework assignments are problem sets and a final project, and both are to be turned in by the beginning of the class session when due. The homework problems will be graded on a five-level system: check-plus (100), check (90), check-minus (80), late (60), not submitted (0). The project score will consist of two parts, a team score and an individual score. All students in an instructor-assigned team receive a team score, from zero to 80. The remainder of each

student's project grade, zero to 20 points, will be based on the evaluations by fellow students on the team. Each student also completes an evaluation for the other students on the team. Students not submitting evaluations receive zero for this individual component.

Homework will be submitted electronically via the course web site Assignment tool as an attachment. Solutions may be handwritten or typed, but submitted in a single .pdf format file, with name and homework number at the top of the first page, and page numbers at the bottom of each page. Files must be submitted in a standard name convention. For homework, the name convention is 'Surname First-Initial HW #.pdf' (for example, 'Lepkowski J HW 1.pdf' or 'West B HW 1.pdf'). For the project, the convention is 'Team name project.pdf' (for example, 'Team A project.pdf'). The submitted homework along with a copy of a solution will be marked and returned as an Assignment tool attachment.

Study groups are useful, and encouraged, for preparing answers to homework exercises and the project. Group answers are not acceptable, except for the project; each student must submit individual homework solutions.

## **EXAMINATIONS & FINAL GRADE**

There will be a short, one-hour, in-class, cumulative, open book / open notes midterm examination the last hour of class on Wednesday, February 22. The closed book final examination will be held on Wednesday, April 25, from 1-4 PM. (If this examination time conflicts with other regularly scheduled examination times for University of Michigan students, students must inform the instructor as soon as possible – a course meeting once per week on Wednesday does not fit into the University of Michigan final examination schedule.)

Final grades will be a weighted composite of homework (30%), class project (35%), and examination scores (35%). The instructors may alter the relative weights, depending on overall class performance on each component of the final grade.

## **ACADEMIC INTEGRITY**

The course will abide by ethical standards at the respective campuses. The University of Maryland has a nationally recognized Honor Code, administered by the Student Honor Council. The Student Honor Council proposed and the University Senate approved the following statement: *I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.* The University honor pledge ordinarily should be *handwritten* and signed on the front cover of all papers, projects, or other academic assignments submitted for evaluation in this course. The instructors waive this requirement for this course. However, homework, exams, or other materials submitted by students to the instructors implicitly include this pledge. Violation of the pledge is a serious matter, and will be dealt with by such measures as a failing mark on the submission or for the entire course.

University of Michigan students are responsible for upholding the policy on academic integrity in the University of Michigan Standard Practice Guide; see <http://spg.umich.edu/pdf/303.03.pdf>.

## **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 & ASSIGNED READING

The principal text for the course will be *Survey Sampling* by Leslie Kish (John Wiley and Sons, Inc., New York, 1965). It is available at university bookstores or through online sales. Students may find other texts useful supplemental reading, including *Introduction to Survey Sampling* by Graham Kalton (Sage Publications, Beverly Hills, 1983), *Sample Survey Methods and Theory*, Volume 1, by Morris Hansen, *et al.* (New York: John Wiley and Sons, Inc., 1953), and *Sampling Techniques*, 3rd edition, by William G. Cochran (New York: John Wiley and Sons, Inc., 1977).

Assigned readings will be available on the course web site:

- [1] Casady, Robert J., and James M. Lepkowski. "Telephone Sampling," Chapter 15 in *Sampling of Populations: Methods and Applications*, Paul Levy and Stanley Lemeshow. New York: Wiley and Sons, Inc., 1999.
- [2] Rust, K. "Variance estimation for complex estimators in sample surveys," *Journal of Official Statistics*, 1(4) (1985): 381-397.
- [3] Kish, L. and Frankel, M. "Inference from complex samples," *Journal of the Royal Statistical Society, Series B*, **36** (1974): 1 - 37.
- [4] Kalton, G. and Kasprzyk, D. "The treatment of missing survey data," *Survey Methodology*, **12** (1986): 1 - 16.

### SYLLABUS

The syllabus below presents approximate dates of lecture topics. Students must complete assigned reading prior to the lecture. Each assignment is to be submitted by the start of the class session when due via the course web site Assignment tool.

Week	Date	Topic	Lecture Site (Inst.) <sup>b</sup>	Project discussion	Reading <sup>a</sup>	Home-work
1	Jan 4	<i>Introduction. SRS.</i>	Perry (BW/JL)	--	Kish 1.0-2.2	--
2	10	Chat room (9-10 PM): <b>HW 1</b>	--	--	--	--
	11	<i>Frames. Cluster sampling.</i>	Lefrak (BW)	--	Kish 2.3-2.7, 5.1	<b>HW 1</b>
3	18	<i>Subsampling. Optimal subsampling.</i>	T10 (BW)	--	Kish 5.2-5.5	--
4	24	Chat room (9-10 PM): <b>HW 2</b>	--	--	--	--
	25	<i>Stratification Proportionate allocation.</i>	Perry (BW)	--	Kish 3.1-3.3	<b>HW 2</b>
5	Feb 1	<i>Other allocations.</i>	Perry	--	Kish 3.4-	--

		<i>Stratification topics.</i>	(BW)		3.5	
6	7	Chat room (9-10 PM): <b>HW 3</b>	--	--	--	--
	8	<i>Stratification topics.</i> <i>Systematic sampling.</i>	Lefrak (BW)	Overview	Kish 4.1- 4.4	<b>HW 3</b>
7	15	<i>Unequal sized clusters.</i> <i>Ratio means.</i>	Perry (BW)	Sample size	Kish 6.1- 6.2	--
8	21	Chat room (9-10 PM): <b>HW 4 &amp; exam</b>	--	--	--	--
	22	<i>Stratified cluster sampling. Midterm exam.</i>	T10 (West), Lefrak (JL)	Optimum subclass size	Kish 6.3- 6.5	<b>HW 4</b>
9	Feb 29	<b>Michigan winter break – no class session.</b>	--	--	--	--
10	Mar 7	<i>PPS &amp; PPES selection.</i>	Perry (JL)	Stratification , allocation	Kish 7.1- 7.5	
11	13	Chat room (9-10 PM): <b>HW 5</b>	--	--	--	--
	14	<i>Area sampling.</i>	Lefrak (JL)	Sampling rate	Kish 9.1- 9.5	<b>HW 5</b>
12	21	<i>Telephone sampling.</i> <i>Variance estimation.</i>	Perry (JL)	PPeS	[1]	
13	28	<i>Variance estimation.</i> <i>Nonsampling error.</i>	Perry (JL)	Estimation	[2], [3]	
14	Apr 3	Chat room (7:30-8:30 PM): <b>HW 6</b>	--	--	--	--
	4	<i>Nonsampling error.</i> <i>Nonresponse.</i>	Lefrak (JL)	Final questions	[4]	<b>HW 6</b>
15	10	Chat room (9-10 PM): <b>Project</b>	--	--	--	--
	11	<i>Weighting and imputation.</i>	T10 (JL)	--	Kish 13.1- 13.6	<b>Project</b>
16	24	Chat room (9-10 PM): <b>Exam</b>	--	--	--	--
	25	<b>Final exam (1:00-4:00 PM).</b>	Perry (Both)	--	--	--

<sup>a</sup>Readings from Kish, or the number of a specified paper. <sup>b</sup>BW = Brady West; JL = Jim Lepkowski.