SURVMETH 625
Methods of Survey Sampling
Summer 2017

CLASS MEETINGS:
12:30-3:00 PM, Tuesday & Thursday, June 6 – July 27, 2017
Room 1208 Lefrak, and Room G300 ISR-Perry

INSTRUCTORS
James Wagner
Room G374 ISR-Perry (U of Michigan) and Room 1218S Lefrak (U of Maryland)
Telephone: 734/647-5600 and 301/314-7911 (U of Maryland)
Email: jameswag@umich.edu

Raphael Nishimura
Telephone: 734/389-4959
Email: raphaeln@umich.edu

ASSISTANTS
TBD

OFFICE HOURS
By Skype or in person, per appointment. See also the 'Chat' schedule.

COURSE CONTENT
Methods of Survey Sampling/Applied Sampling is an applied statistics methods course, but differs from most statistics courses because it is concerned almost exclusively with the *design* of data collection. Methods for the analysis of collected data will not be discussed much in the course. The course will concentrate on problems of applying sampling methods to human populations, since sampling human populations poses a number of particular problems not found in sampling of other types of units. The principles of sample selection, though, can be applied 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. Therefore, a sound background in applied statistics is necessary. A thorough understanding of the notation and results will be required.

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

CLASS SESSIONS
Class sessions are twice per week, starting at 12:30 PM each day, with one 10 minute break. Class sessions end at 3:00 PM.

The course will be simultaneously transmitted through compressed video technology between the Joint Program in Survey Methodology at the University of Maryland, the Institute for Social Research at the University of Michigan, and – depending upon enrollment -- the US Census Bureau in Suitland, Maryland. The interactive audio-video system allows those at the transmitting site to see and hear those at

the remote site(s), and those at the remote site(s) to see and hear those at the transmitting site.

All class sessions will be recorded, and may be viewed later with standard 'browser' software. Instructions will be provided via email on how to log on and view recorded sessions. Our JPSM video coordinator can assist students having difficult viewing recorded sessions.

Lecture notes and other materials will be presented on projection systems in each room. Students have access to a copy of all materials presented on the projectors through the course web site (via Canvas), although handwritten notes will be inserted in lecture frequently.

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

HOMEWORK

The homework assignments are to be turned in by the beginning of the class session when due. The regular problems will be graded on a five level system: check-plus (100), check (90), check-minus (80), late (60), not submitted (0). The 'late' score will be assigned for any assignment turned in after the assigned time and day, without prior permission of the instructors.

Homework will be submitted electronically via the course web site as an attachment to the Assignment tool. Students must submit solutions, handwritten or typed, in a single .pdf format file, with name and homework set 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: 'Surname First Initial HW #.pdf'. For example, 'Wagner J HW 1.pdf'. The submitted homework will be marked electronically and returned via the Assignment tool as an attachment, along with a copy of a homework solution.

Study groups are useful, and encouraged. Group answers are not acceptable. Each student must submit individual homework exercise solutions.

Optional homework preview sessions will be held at 4-5 PM June 8, 15, 22, July 3, 11 and 18. The purpose of the preview sessions will be to answer questions about the homework assignments due at the beginning of the next class session. These homework preview sessions will be held in ISR368 and will be recorded and available for video viewing.

Optional homework practice sessions will be held at 4-5 PM on June 27, July 6, 13, 20, and 26. These practice sessions will be held in ISR368 and will be recorded and available for video viewing.

The project is a multi-stage sampling exercise distributed early in the term, and discussed throughout the course during class sessions. The instructors will assign 4-5 students each to project teams during week three (around June 20). Each team will submit one copy of the project in .pdf format with name 'Team # project.pdf' (for example, 'Team A project.pdf') via the Assignment tool.

All students in a team receive the same base score (maximum 80 points). Each student also completes an evaluation for the other students in the team. The remainder of each student's project grade (maximum 20 points) will be based on the evaluations by fellow students in the team. Students who do not turn in evaluations of other team members will receive zero for the individual component, regardless of team ratings.

EXAMINATIONS AND FINAL GRADE

There will be a in-class cumulative open book, open notes midterm examination on Friday, June 30, 3:30-6:00 PM. The cumulative, open book, open notes final examination will be held Thursday, July 27, 12:30-3:00 PM.

Final grades will be a weighted composite of homework (approximately 30%), class project (approximately 30%), and examination scores (approximately 40%). 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 respective campuses. The University of Maryland, College Park, has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity for all undergraduate and graduate students. Maryland students (including Census Bureau enrollees) are responsible for upholding these standards and being aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Maryland Code of Academic Integrity, visit http://www.president.umd.edu/policies/iii100a.html.

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

TEXTBOOKS AND 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 that the following texts serve as useful supplemental reading to several lecture topics: *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).

There are also assigned readings of several papers (see list below), available on Canvas.

[1] Rust, K. "Variance estimation for complex estimators in sample surveys," *Journal of Official Statistics*, 1(4) (1985): 381-397.

[2] Kish, L. and Frankel, M. "Inference from complex samples," *Journal of the Royal Statistical Society*, Series B, **36** (1974): 1 - 37.

[3] 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.

[4] Kalton, G. and Kasprzyk, D. "The treatment of missing survey data," *Survey Methodology*, **12** (1986): 1 - 16.

[5] "Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys Revised 2016," downloaded from aapor.org, May, 2016.

SYLLABUS

Date		Time	Topic	Readings[a]	HW
June	6	12:30-3	**Lecture:** Course introduction, principles in sample selection, & simple random sampling (JW).	Kish 1.0-7	
	7	11-12:00	**Chat:** Canvas Chat Tool (JW).		
	8	12:30-3	**Lecture:** Simple random sampling, frame problems, weights, and weighted estimators (JW)	Kish 2.1-7	
		4:00-5:00[b]	**Homework:** Preview HW 1 (RN).		
	12	7:00-8pm	**Chat:** via Skype, Google hangout or by phone (TBD)		
	13	12:30-3	**Lecture:** Cluster sampling, two stage sampling, & intra-cluster homogeneity (JW).	Kish 5.1-4	1
	14	11-12:00	**Chat:** Canvas Chat Tool PM (JW).		
	15	12:30-3	**Lecture:** Unequal sized cluster sampling & stratified sampling (JW). Project introduction.	Kish 6.1-2, 3.1-3	
		4:00-5:00[b]	**Homework**: Preview HW 2 (RN).		
	19	7:00-8pm	**Chat:** via Skype, Google hangout or by phone (TBD)		
	20	12:30-3	**Lecture:** Sample allocation, stratification topics, & project discussion (JW).	Kish 3.4-6	2
	21	11-12:00	**Chat:** Canvas Chat Tool (RN).		
	22	12:30-3	**Lecture:** Stratified cluster sampling, systematic sampling, & project discussion (JW).	Kish 4.1-2, 6.3-5	
		4:00-5:00[b]	**Homework:** Preview HW 3 (RN).		
	26	7:00-8pm	**Chat:** via Skype, Google hangout or by phone (TBD)		
	27	12:30-3	**Lecture:** Complex sampling (weighting, stratification, cluster selection) & project discussion (JW).	Kish 5.5, 11.7	3
	28	11-12:00	**Chat:** Canvas Chat Tool (RN).		
	29	12:30-3	**Lecture:** Controlling sample size & probability proportionate to size selection (JW).	Kish 7.1-3	
		4:00-5:00[b]	**Practice:** Homework problems, exam preparation (RN).		
	30	3:30-6	**Examination:** Open book, open notes in-class cumulative midterm.		
July	3	4:00-5:00[b]	**Homework**: Preview HW 4 (RN).		
	6	12:30-3	**Lecture:** Probability proportionate to size selection, PPS problems, & PPeS selection (RN).	Kish 7.4-5	4
		4:00-5:00[b]	Practice: **Homework problems & exam review (RN).**		
	10	7:00-8pm	Chat: **via Skype, Google hangout or by phone (TBD)**		
	11	12:30-3	**Lecture:** Area sampling (two & three stage) & project discussion (RN).	Kish 9.1-7	
		4:00-5:00[b]	**Homework:** Preview HW 5 (RN).		
	12	11-12:00	**Chat:** Canvas Chat Tool (RN).		
	13	12:30-3	**Lecture:** Variance estimation (collapsing & combining strata), Balanced and jackknife repeated replication, & project discussion (RN).	Kish 4.3-4, [1]	5
		4:00-5:00[b]	**Practice:** Homework problems (RN).		
	18	12:30-3	**Lecture:** Balanced/jackknife repeated replication, generalized variances, software, Telephone Sampling & project discussion (RN).	Kish 14.1-3, [2][3]	
		4:00-5:00[b]	**Homework:** Preview HW 6 (RN).		
	19	11-12:00	**Chat:** Canvas Chat Tool (RN).		

Date	Time	Topic	Readings[a]	HW
20	12:30-3	**Lecture:** Telephone sampling, Total survey error, response error, non-observation error, & nonresponse adjustment (RN).	Kish 13.1-2, **[4] [5]**	6
	4:00-5:00[b]	**Practice:** Homework problems (RN).		
25	12:30-3	**Lecture:** Nonresponse adjustments, item missing data, compensating for item missing data, & review (RN).	Kish 13.3-6	Project
26	11-12:00	**Chat:** Canvas Chat Tool (RN).		
	4:00-5:00[b]	**Practice** Homework problems & exam review (RN).		
27	12:30-3	**Examination:** Open book, open notes in-class cumulative final.		

[a] Readings are from the textbooks by Kish, or from specified papers.
[b] ISR368.