

## SAMPLING AND SURVEY TECHNIQUES

**Lecture:** REC 122  
Mon., Wed., Fri., 11:30 – 12:20 p.m.

**Labs:** TBD

**Professor:** Sharon Christ                    **Grader:** Jincheng Bai  
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**Office hours:** by appointment

### **Class Website:**

The course webpage is hosted by Blackboard Learn. When you login to Blackboard you should automatically have access to the webpage. The webpage will contain: overheads from presentations given in lecture, in-class exercises, handouts, syntax files and data sets, homework assignments, supplemental readings, exam review sheets, etc.

**Required Text:** Lohr, Sharon L. (2010). Sampling Design and Analysis (2<sup>nd</sup> edition). Boston, MA: Brooks/Cole.

### **Course Description and Objectives:**

This course is designed to provide you with a basic understanding of foundational concepts of sampling statistics. This includes understanding 1) the different types of sampling design components, 2) when and why these components are used and how to use them in a sample design, 3) how these components affect estimation and testing including how they violate assumptions of standard statistical analysis, and 3) proper design-based and model-based approaches to estimation and inference of data collected using complex sample designs.

The course will include a mix of both theory and applications including interpretation of statistical results. This is not a course about data collection or survey design, but these topics are touched upon.

**Learning objectives** include:

- Develop a basic understanding of probability and inferential theory underlying sampling statistics
- Understand and apply complex sample design features to sampling plans
- Apply proper statistical analyses to data collected using complex sample designs
- Properly interpret statistical estimates and tests
- Analyze data from complex samples using SAS, STATA or other software
- Improve analytic and critical thinking skills
- Improve written and verbal communication of theory and analytics

**Communication:**

The discussion board app is available on the course webpage. Students may use this to communicate with each other and with me. Often, other students can answer your questions very well. I will check this regularly and contribute where needed.

I will email the whole class often with updates through the blackboard website. These emails are also in the announcements thread. You may email me personally as needed.

**Course Components:**

**Readings:** Reading assignments from the text are outlined in the Course Topics outline below. Completing the readings will greatly help with your understanding of the material presented in class. Also, the homework and exams have similar problems to those presented in the text. On occasion, additional readings from other resources will be provided on the course webpage.

**Class meetings:** During class we will cover the topics in the Course Topics outline below in the order they are presented. We may not complete all topics, depending on time. Class time will include lecture, in-class exercises, software demonstration, group activities, and discussion. During some classes, I will be demonstrating analysis using SAS or STATA statistical software.

**Computer Lab meetings:** We will meet in an ITap lab tentatively for about six to eight class periods. During these labs we will complete exercises and work on homework using statistical software available in the lab. Lab locations will be announced as they are setup during the semester.

**Homework:** Homework assignments will be due approximately every week over the course of the semester. These generally involve manual computation, short answer, analysis of data using statistical software, and interpretation of results. You may work together with others on assignments, but you must turn in a separate homework that is your own work. Homework with the same writing, samples, etc. will be given a grade of 0. Homework will account for 40% of your final grade. Your lowest homework grade will be dropped to improve your overall homework grade for the course.

**Statistical Software:** We will mostly use SAS software. SAS will be used for many of the homework assignments. SAS is available in all ITaP instructional labs as well as through software remote. Also, a personal copy of SAS software is available to Purdue students through ITap. You may use alternative statistical software packages that handle complex sample data (e.g., STATA, R).

**Exams:** There will be three exams during the course of the semester, two midterms and a final exam. The final exam is cumulative. We will have one class session for review before each exam. Each midterm account for 15% and the final accounts for 20% of the course grade.

**Sample Design Paper:** This will be a short paper where you propose a sampling design for data collection from a real population. An outline for this paper will be handed out and discussed in advance of the due date. This paper will account for 10% of your course grade.

### **Grading:**

**Final Course Grade:** Your course grade will be weighted based on the following course component percentages:

Homework:	40%
Paper:	10%
Midterm Exams:	15% each
Final Exam:	20%

Final grades will be assigned according to the following scale:

A:	> 93%	C+:	77 – 79%
A-:	90 – 92%	C:	73 – 76%
B+:	87 – 89%	C-:	70 – 72%
B:	83 – 86%	D:	< 70%
B-:	80 – 82%	F:	< 60%

**COURSE TOPICS AND ASSOCIATED READINGS:****A. Introduction & Review of Relevant Probability***Reading: Appendix A and Chapter 1***B. Simple Probability Samples***Reading: Chapter 2***C. Stratified Sampling***Reading: Chapter 3***D. Ratio and Regression Estimation***Reading: Chapter 4***E. Cluster Sampling with Equal Probabilities***Reading: Chapter 5***F. Sampling with Unequal Probabilities***Reading: Chapter 6***G. Complex Surveys***Reading: Chapter 7, just sections 7.1, 7.2, and 7.5 – 7.7***H. Variance Estimation in Complex Surveys***Reading: Chapter 9***I. Nonresponse***Reading: Chapter 8***ADDITIONAL TOPICS (covered as time permits):****J. Survey Quality***Reading: Chapter 15***K. Two-Phase Sampling***Reading: Chapter 12***L. Estimating Population Size and Small Area Estimation***Reading: Chapters 13 & 14*

**Schedule:**

The tentative schedule of major due dates is provided below. **There will likely be changes to this schedule depending on course tempo.** I will provide updated to any major due dates/exams.

**Tentative Course Schedule of Special Events:**

Date	Event(s)
Jan 20	MLK Day – NO CLASS
Feb 21	Exam 1 Review
Feb 24	EXAM 1
March 16 - 20	SPRING BREAK – NO CLASS
April 3	Exam 2 Review
April 6	EXAM 2
April 24	Sampling Paper Due
April 29 & May 1	Final Exam Review
<b>May 4 – May 8</b>	<b>FINAL EXAM WEEK</b>

**Holiday Schedule:**

Students will not be expected to do course-related work on university-recognized holidays (i.e., Labor Day, Thanksgiving Day). If other significant holidays or observances related to your background, identity, and/or religious practices overlap with assignment due dates, please contact me and we can make a plan to work around your observances.

**Accommodations:**

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on different abilities or disabilities, you are welcome to let me know so that we can discuss options for making accommodations for you. You are also encouraged to contact the **Disability Resource Center (DRC)** by email at [drc@purdue.edu](mailto:drc@purdue.edu), by phone at (765)-494-1247, or in person at Young Hall, 155 S. Grant St., Room 830, West Lafayette, IN 47907.

**Non-Discrimination:**

Purdue University and this instructor are committed to maintaining a community which values the worth and dignity of every person and fosters sensitivity, understanding, and mutual respect among its members. We will not tolerate discrimination on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran.

**Psychological Health and Wellness:**

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)-494-6995 and <http://www.purdue.edu/caps/> during and after hours, on weekends and holidays, or at the Purdue University Student Health Center (PUSH) during business hours.

**Academic Integrity:**

- Academic integrity is among the highest values held by Purdue University. Individuals are encouraged to alert university officials to potential breaches of this value by email at [integrity@purdue.edu](mailto:integrity@purdue.edu) or by phone at 765-494-8778. Information may be submitted anonymously.
- All work turned into the instructor for course credit must be original. In addition to a failing grade for the assignment, the penalties for academic dishonesty may consist of: a failing final grade (i.e., "F) for the course, academic probation or other university sanctions, or even suspension or expulsion from the university, in some cases.
- Students who are suspected of any form of cheating or plagiarism will also be reported to the Office of the Dean of Students. Please review the university policies regarding academic integrity at: <http://www.purdue.edu/ODOS/osrr/integrity.htm>

*"As a Boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together, we are Purdue."* – Purdue University Code of Honor

**Campus Emergencies:**

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. I will try to send out messages through the class listserv and course webpage regarding emergencies affecting our class. Also, get information about changes in this course on the course Blackboard web page or email me at [slchrist@purdue.edu](mailto:slchrist@purdue.edu).

Emergency information and updates will be posted on Purdue's homepage at  
<http://www.purdue.edu>

Students should sign up for emergency text messages here:  
[https://www.purdue.edu/newsroom/health\\_safety/mail.html](https://www.purdue.edu/newsroom/health_safety/mail.html)

Also, the following webpage details university policies and procedures during various emergency events: [https://www.purdue.edu/emergency\\_preparedness/flipchart/index.html](https://www.purdue.edu/emergency_preparedness/flipchart/index.html).

**EMERGENCY NOTIFICATION PROCEDURES are based on a simple concept – if you hear a fire alarm inside, proceed outside. If you hear a siren outside, proceed inside.**

- Indoor Fire Alarms mean to stop class or research and immediately evacuate the building.
  - Proceed to your Emergency Assembly Area away from building doors. Remain outside until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.
- All Hazards Outdoor Emergency Warning Sirens mean to immediately seek shelter (Shelter in Place) in a safe location within the closest building.
  - “Shelter in place” means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, an active threat including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency\*. Remain in place until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

\*In both cases, you should seek additional clarifying information by all means possible...Purdue Emergency Status page, text message, Twitter, Desktop Alert, Albertus Beacon, digital signs, email alert, TV, radio, etc....review the Purdue Emergency Warning Notification System multi-communication layers at [http://www.purdue.edu/ehps/emergency\\_preparedness/warning-system.html](http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html)

**EMERGENCY REONSE PROCEDURES:**

- Review the Emergency Procedures Guidelines at:  
[https://www.purdue.edu/emergency\\_preparedness/flipchart/index.html](https://www.purdue.edu/emergency_preparedness/flipchart/index.html)
- Review the Building Emergency Plan (available on the Purdue Emergency Preparedness website or from the Building Deputy) for:
  - Evacuation routes, exit points, and emergency assembly area
  - When and how to evacuate the building
  - Shelter-in-place procedures and locations
  - Additional building-specific procedures and requirements.

**EMERGENCY PREPAREDNESS AWARENESS VIDEOS**

- “Run. Hide. Fight. ®” is a 6-minute active shooter awareness video that illustrates what to look for and how to prepare and react to this type of incident. See:  
[http://www.youtube.com/watch?v=5mzl\\_5aj4Vs](http://www.youtube.com/watch?v=5mzl_5aj4Vs) (Link also located on the Purdue Emergency Preparedness website)

**MORE INFORMATION**

- Reference the Emergency Preparedness website for additional information:  
[https://www.purdue.edu/ehps/emergency\\_preparedness/](https://www.purdue.edu/ehps/emergency_preparedness/)