SAMPLING AND SURVEY TECHNIQUES

Lecture: WNG, Room 2579
Mon., Wed., Fri., 10:30 – 11:20 a.m.

Professor: Sharon Christ  Grader: Min Ren
Office: 225 Hanley Hall
Phone: 496-1638
Email: slchrist@purdue.edu
Office hours: by appointment

Class Website: http://itap.purdue.edu/ltl/blackboard/
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.

Class Listserv: spring-2016-stat-52200umbslchrist001@lists.purdue.edu


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, 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 or other software
- Improve analytic and critical thinking skills
- Improve written and verbal communication of theory and analytics

Communication:
The course has a listserv, which I frequently use to communicate with the class. Updates and reminders on upcoming readings and homework assignments are provided through email. Changes to the schedule are also provided this way. I often share answers to questions posed by students when they are relevant to the whole class.

The discussion board app is also available on the course webpage. Students may use this to communicate with each other. Often, other students can answer your questions very well. I will check this regularly and contribute where 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 may 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 mostly be demonstrating analysis using SAS statistical software. You may bring a laptop and follow along during class. A personal copy of SAS software is available to Purdue students through ITap.

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 45% of your final grade. Your lowest homework grade will be dropped to improve your overall homework grade for the course.

**Statistical Software:** We will 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. 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 time to review before each exam. Each midterm account for 10% and the final accounts for 25% 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.

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

- Homework: 45%
- Paper: 10%
- Midterm Exams: 20%
- Final Exam: 25%

Final grades will be assigned according to the following scale:

- **A+:** > 96%
- **A:** 93 – 96%
- **A-:** 90 – 92%
- **B+:** 87 – 89%
- **B:** 83 – 86%
- **B-:** 80 – 82%
- **C+:** 77 – 79%
- **C:** 73 – 76%
- **C-:** 70 – 72%
- **D:** < 70%
- **F:** < 60%
Academic Integrity

Students are advised to familiarize themselves with the University’s regulations regarding student conduct in academic endeavors. This information is located at the following website: http://www.purdue.edu/univregs/pages/stu_conduct/stu_regulations.html. Students who are suspected to be in violation of the University’s regulations regarding academic dishonesty, including but not limited to plagiarism and cheating, will be dealt with in accordance with University policy. This may result in a referral to the Office of the Dean of Students and penalties for the assignment(s) in question.

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:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 18</td>
<td>MLK Day – NO CLASS</td>
</tr>
<tr>
<td>Feb 17</td>
<td>Exam 1 Review</td>
</tr>
<tr>
<td>Feb 19</td>
<td>EXAM 1</td>
</tr>
<tr>
<td>March 14-18</td>
<td>SPRING BREAK – NO CLASS</td>
</tr>
<tr>
<td>March 30</td>
<td>Exam 2 Review</td>
</tr>
<tr>
<td>April 1</td>
<td>EXAM 2</td>
</tr>
</tbody>
</table>
Tentative Course Schedule of Special Events:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 22</td>
<td>Sampling Paper Due</td>
</tr>
<tr>
<td>April 27 &amp; 29</td>
<td>Final Exam Review</td>
</tr>
<tr>
<td>May 2 - 7</td>
<td>FINAL EXAM WEEK</td>
</tr>
</tbody>
</table>

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 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.

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: http://www.purdue.edu/securepurdue/. Also, the following webpage details university policies and procedures during various emergency events: https://www.purdue.edu/emergency_preparedness/flipchart/index.html.