Course Syllabus
STAT 431 Introduction to Sampling
Fall 2021

1 General Course Information and Instructor Data

Course Information:

Course Method of Instruction: In person, with live-streaming via Zoom. You may attend class either in person, or virtually. This will be recorded. Exams will tentatively be given in-person.

Due Dates / Times: All times listed in the syllabus, on Blackboard, and on Gradescope are ***CENTRAL TIME***.

Start / End Date of Course:

The course will start on the first day of classes: August 23, 2021.

There will be no class on Labor Day: September 6, 2021.

There will be no class for Thanksgiving: November 25–26,2021.

The last day of class will be December 3, 2021.

Finals week starts December 6, 2021.

Lecture Sessions:

MWF 10:00 – 10:50 pm, SEO 636 and Online via Zoom (live-stream)

CRN 38335 Undergraduate (3 credit hours)

CRN 38336 Graduate (4 credit hours)

Instructor: Dr. Jennifer Pajda-De La O

Email: jpajda2 AT uic.edu Your email will be answered within 24-48 hours.

Online Drop-in Hours via Zoom: Monday / Wednesday / Friday 1:15 pm – 2:15 pm

- See Blackboard for Zoom Links.
- For a guaranteed time, please make an appointment on Blackboard. If you are unable to make an appointment, you can still join my office hours and I will help you in the order you join the meeting, but I give priority to those who made an appointment.
- You can ask questions on Piazza.
- I will also answer questions via email, or during optional lecture sessions.

Face Masks (UIC Policy): Masks covering both the mouth and nose must be worn at all times by all students, faculty, and staff while on campus and inside any building regardless of vaccination status. If you do not wear a mask, you will be asked to leave the classroom and will not be allowed back in class unless or until you wear a mask. If you have forgotten your mask, you may pick one up from one of the student information desks on campus during the first two weeks of campus. Students who do not comply with the mask-wearing policy will be reported to the Dean of Students. Eating and drinking are not allowed in classrooms.

- If a student refuses to wear a mask, they will be asked to leave the classroom and will be reported to the Dean of Students. A COVID-19 Non-Compliance Report will be made.
- If a student refuses to wear a mask and refuses to leave the classroom, this is considered student misconduct and will be reported to the Dean of Students using the Student Misconduct Incident Report Form.
- If a student refuses to leave the classroom and is disruptive and the instructor considers this a nonemergency situation, then they will contact the Dean of Students Office at 312-996-4857. For an emergency situation, where the student threatens violence or poses an urgent safety threat, the UIC Police will be called.

2 Instructor Copyright

The course coordinator and instructor have spent a lot of time developing material for this, and other courses. We retain copyright of all materials created and developed for this course. Do not upload course materials onto third-party websites (this includes screenshots of the material; this includes questions that we have written on assignments that you have typed out yourself). Do not share materials with anyone who is not enrolled in this course.

3 Prerequisites

Grade of C or better in STAT 411 or STAT 481.

4 Required Course Materials

4.1 Textbook

Sharon L. Lohr, *Sampling: Design and Analysis*, **2nd** edition, 2010, Brooks / Cole, Cengage Learning.

4.2 Extra Resources (not required)

A.S. Hedayat and B.K. Sinha, *Design and Inference in Finite Population Sampling*, 1991, Wiley. ISBN: 978-0471880738.

4.3 Gradescope

Written Homework and Projects will be submitted here. This is integrated with Blackboard. To access, click on the link within Blackboard.

4.3.1 Gradescope Homework Uploads

- To access Gradescope, click on the link within Blackboard.
- You may use your phone to scan in homework.
- You can overwrite an uploaded file if you submitted the incorrect one. At the bottom right corner, click on "Resubmit" and you can change the file(s) that you uploaded.

4.4 SAS Software

SAS will be used to demonstrate how to design and analyze data.

- Access using SAS OnDemand for Academics (Free). Create a SAS profile to get started.
- Website Login: `https://welcome.oda.sas.com/login`
- Another option is to access SAS using UIC's Virtual Computer Lab.

4.5 UIC's Virtual Computer Lab

- These instructions are to connect to UIC's Virtual Computer Lab using your web browser.
- This applies to Mozilla Firefox, Google Chrome, Internet Explorer, and Microsoft Edge (and Edge Chronium).
- For screenshots of the below instructions, go to `https://help.uillinois.edu/TDClient/37/uic/KB/ArticleDet?ID=1410`.
  1. Navigate to the windows virtual desktop website: `http://desktop.uic.edu`.
  2. Enter your UIC email address then click Next.
  3. Enter your password, then click Sign In.
  4. Select the desktop you would like to access.
  5. Select options as desired, then click allow.
  6. Enter your NetID and password when prompted and click Submit.
  7. When you are finished, log off.
- If you need to connect to UIC's Virtual Computer Lab using a mobile device follow the instructions here: `https://help.uillinois.edu/TDClient/37/uic/KB/ArticleDet?ID=1122`.

5 Additional Course Communications

5.1 News & Announcements

Any announcements will be posted on Blackboard and is where you may find course- and program-related announcements made by the instructor or teaching assistants. All members of the course will receive an email of each message posted.

5.2 Course Communications using Piazza:

This term we will be using Piazza for help from classmates. The system is highly catered to getting you help fast and efficiently from classmates, the TAs, the instructor, and the course coordinator. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Please direct the class questions that are not private to this board. This board is reviewed by all TAs and the professor, and you will get faster answers if you post your questions there. (Your question will be answered within 24 hours except during weekends.)

5.3 Online Course Communication Guidelines (Netiquette)

- Be mindful of different cultural and linguistic backgrounds, as well as different political ideologies and religious beliefs.
- Use good judgment when composing your written responses. Swearing and profanity should be avoided. Also consider that slang terms can be misunderstood or misinterpreted.
- Be careful using all capital letters when composing your written responses. This can be considered shouting on the Internet and is regarded as impolite or aggressive. It can also be stressful on the eye when trying to read your message.
- Be respectful of others views and opinions. Avoid "flaming" (publicly attacking or insulting) others.
- Be careful when using acronyms. If you use an acronym it is best to spell out its meaning first, then put the acronym in parentheses afterward, for example: Frequently Asked Questions (FAQs). After that you can use the acronym freely throughout your message.
- Use good grammar and spelling in written communications.
- In emails, always identify yourself and what class and section you are in. It is a good practice to put your course and section in the subject line. This helps your instructor identify course related emails.

6 Technology Requirements

6.1 Computer / Technology Requirements

- Online students will need regular access to a personal computer that runs on a broadband Internet connection.
- You may contact ACCC to request and borrow a laptop or be assigned a hotspot for the semester if you do not have the required hardware and internet capabilities. `https://help.uillinois.edu/TDClient/37/uic/Requests/ServiceDet?ID=450`

6.2 Blackboard Learning Management System

- It is expected that all students understand how to use Blackboard and any other apps linked inside it. If you have questions, please come to us within the first three weeks of the course so we can explain how to use an access materials.
- For all technical questions about Blackboard, email ACCC-Learning Technology Solutions at LTS@uic.edu

6.3 Privacy Notification and Policy for Video Recording of Synchronous Class Sessions

We will be recording the class sessions, or portions of the class, for students who are unable to attend synchronously. The recording feature for others is disabled so that no one else will be able to record this session through Zoom, Blackboard Collaborate, Webex, or Echo360. Recording by other means is not permitted. The recorded class sessions will be posted on our Blackboard class website unless otherwise notified.

If you have privacy concerns and do not wish to appear in the recording, turn OFF your video and notify me in writing (via email) prior to the next class session. If you prefer to use a pseudonym instead of your name, please let me know what name you will be using, so that I can identify you during the class session. If you would like to ask a question, you may do so privately through the chat feature by addressing your question to me or your TA only (and not to everyone), or you may contact me or your TA by another private method, which we will agree upon in advance of class. If you have questions or concerns about this video recording policy, please contact me before the end of the first week of class.

7 Academic Deadlines

Current academic calendar and the list of deadlines can be found at
`https://catalog.uic.edu/ucat/academic-calendar/`

8 Course Description and Topics

8.1 Course Description

Simple random sampling; sampling proportions; estimation of sample size; stratified random sampling; ratio estimators; regression estimators; systematic and cluster sampling. SAS will be used to demonstrate how to design and analyze data.

8.2 Course Topics

- Chapter 1: Introduction
  - 1.1: A Sample Controversy
  - 1.2: Requirements of a Good Sample
  - 1.3: Selection Bias
  - 1.4: Measurement Error
  - 1.5: Questionnaire Design
  - 1.6: Sampling and Nonsampling Errors
- Chapter 2: Simple Probability Samples
  - 2.1: Types of Probability Samples
  - 2.2: Framework for Probability Sampling
  - 2.3: Simple Random Sampling
  - 2.4: Sampling Weights
  - 2.5: Confidence Intervals
  - 2.6: Sample Size Estimation
  - 2.7: Systematic Sampling
  - 2.8: Randomization Theory Results for Simple Random Sampling
  - 2.9: A Prediction Approach for Simple Random Sampling
  - 2.10: When Should a Simple Random Sample Be Used?
- Chapter 3: Stratified Sampling
  - 3.1: What is Stratified Sampling?
  - 3.2: Theory of Stratified Sampling
  - 3.3: Sampling Weights in Stratified Random Sampling
  - 3.4: Allocating Observations to Strata
  - 3.5: Defining Strata
  - 3.6: Model-Based Inference for Stratified Sampling
  - 3.7: Quota Sampling
- Chapter 4: Ratio and Regression Estimation
  - 4.1: Ratio Estimation in a Simple Random Sample
  - 4.2: Estimation in Domains
  - 4.3: Regression Estimation in Simple Random Sampling
  - 4.4: Poststratification
  - 4.5: Ratio Estimation with Stratified Samples
  - 4.6: Model-Based Theory for Ratio and Regression Estimation

- Chapter 5: Cluster Sampling with Equal Probabilities
  - 5.1: Notation for Cluster Sampling
  - 5.2: One-Stage Cluster Sampling
  - 5.3: Two-Stage Cluster Sampling
  - 5.4: Designing a Cluster Sample
  - 5.5: Systematic Sampling
  - 5.6: Model-Based Inference in Cluster Sampling
- Chapter 6: Sampling with Unequal Probabilities
  - 6.1: Sampling One Primary Sampling Unit
  - 6.2: One-Stage Sampling with Replacement
  - 6.3: Two-Stage Sampling with Replacement
  - 6.4: Unequal-Probability Sampling Without Replacement
  - 6.5: Examples of Unequal-Probability Samples
  - 6.6: Randomization Theory Results and Proofs
  - 6.7: Models and Unequal-Probability Sampling
- Chapter 7: Complex Surveys
  - 7.1: Assembling Design Components
  - 7.2: Sampling Weights
  - 7.3: Estimating a Distribution Function
  - 7.4: Plotting Data from a Complex Survey
  - 7.5: Design Effects
  - 7.6: The National Crime Victimzation Survey
  - 7.7: Sampling and Design of Experiments
- Chapter 8: Nonresponse
  - 8.1: Effects of Ignoring Nonresponse
  - 8.2: Designing Surveys to Reduce Nonsampling Errors
  - 8.3: Callbacks and Two-Phase Sampling
  - 8.4: Mechanisms for Nonresponse
  - 8.5: Weighting Methods for Nonresponse
  - 8.6: Imputation
  - 8.7: Parametric Models for Nonresponse
  - 8.8: What is an Acceptable Response Rate?

9 Course Requirements:

9.1 Written Homework

- Homework will be assigned regularly and due by the due date. Problems will be posted on Blackboard.
- Homework will be submitted via Gradescope.
- Due on the due date by ***11:59 PM***.
- The lowest 1 written homework score will be dropped.
- All written homework assignments will be weighted equally to each other.
- **No late homework will be accepted** because solutions are posted the next day after it is due. **Copying solutions directly from the solution manual or from third-party websites will not be tolerated**, and will result in a zero for the homework assignment. Repeat offenders will be subject to a letter grade drop on your overall grade for the semester.
- You may discuss homework problems with your fellow students (and use Piazza), but you must write your answers up independently, and in your own words. Asking for assistance, or viewing solutions through third-party websites (like Chegg) is not permitted.
- Regrades will be open for each assignment until December 6, 2021 at 11:59 pm.
- We highly recommend you upload your assignment before the due date in case of internet issues. If you have internet issues the night homework is due, we must have documentation of the internet outage our your homework will not be accepted. Solutions are released promptly the day after a homework is due.

9.2 Exams

9.2.1 Description

- There will be two exams during the semester that must be completed by yourself (no collaboration - verbal or written).
- Tentative: Will be taken IN-PERSON. Please email me / talk with me if you need to discuss alternative arrangements.
- Calculators are allowed on exams, including those capable of symbolic algebra. However, most problems require you to "show each step"–and thus **NO** credit will be given unless you show all work by hand.
- Students should bring and display their UIC ID cards during exams. (Academic dishonesty: Cheating on exams typically results in disciplinary procedures, up to expulsion from the university).
- If you have a **valid** excuse for missing a midterm let us know in advance. In case you are ill on the day of a midterm, give a written evidence/explanation of your absence (e.g. doctor's notes) upon returning to class. There will be **no make up exams**. If your excuse is valid with a written document, the missing exam will be replaced by the final (percentage wise). Otherwise it counts as zero. No other exam replacements / substitutions are permitted.
- There will be **NO** make ups for the final exam. Exceptions will be made only for emergencies, e.g., hospitalization or conflicts in final exam scheduling.

9.2.2 Tentative Exam Dates

- Exam 1: Friday, October 15
- Exam 2: Friday, December 10 from 10:30 am - 12:30 pm (Finals Week)

9.2.3 On-Campus Exams (UIC Requirements)

This course will require students to be on campus for in-person exams (see above). If you are a student who is not coming to campus to attend classes, you will be required to adhere to the campus COVID-19 testing requirements and have a saliva test prior to coming to campus to take the exam. Saliva testing must be completed at UIC not earlier than 48 hours and not more than 72 hours ahead of the exam date, so that the test result is available (and negative) by the date of the examination. You must be prepared to present their UIC Daily Pass at the examination site. Note that the Saliva Testing Badge AND the Healthcheck Badge must be green to sit for the examination. A process for validation of these badges prior to in-person exams is under development and will be communicated via an email announcement through our Blackboard course site as well as an announcement during class. All students are responsible for monitoring the Blackboard course announcements to ensure such messages do not get missed.

9.3 Project

- The project will be due by the stated due date, and submitted through Gradescope.
- NO LATE PROJECTS ACCEPTED.
- All work must be shown and / or code provided for full credit.
- More details will be provided on the project later in the semester.

10 Grading and Evaluation

Grading:

Midterm 1: 20%	Project: 20%
Midterm 2: 20%	Written Homework: 40%

Grades will be assigned according to the following rule:

$$A \geq 90\% > B \geq 80\% > C \geq 70\% > D \geq 60\% > F.$$

We reserve the right to make adjustments to the overall grading policy.

Regrades: Regrade requests for written homework and R projects may be submitted through Gradescope. You may submit a regrade request through December 6, 2021 at 11:59 pm. After this time, no regrade requests will be accepted.

Cheating:

- If caught cheating on ANY assignment / assessment, you will receive a 0% for the particular assignment / assessment, and you will be reported to the Dean of Students.
- Repeat offenders will receive 0's for the assignments, will have their overall letter grade for the semester dropped by one, and will be reported to the Dean of Students.
- You will NOT receive an email from the instructor in advance regarding this. All communication regarding any suspected cheating will be through the Dean of Students.

Feedback on Assignments:

- No feedback will be provided on MyOpenMath Online Homework assignments.
- Feedback on discussions will be provided within a few days of the due date.
- Feedback on written homework, R assignments, and Mini-Exams will be provided within a week and a half of the due date.
- Announcements will be made if feedback will take longer than this to complete.

11 Academic Honesty

Academic Integrity Policy
As an academic community, UIC is committed to providing an environment in which research, learning, and scholarship can flourish and in which all endeavors are guided by academic and professional integrity. All members of the campus community – students, staff, faculty, and administrators – share the responsibility of insuring that these standards are upheld so that such an environment exists. Instances of academic misconduct by students will be handled pursuant to the Student Disciplinary Policy:
`https://dos.uic.edu/wp-content/uploads/sites/262/2018/10/DOS-Student-Disciplinary-Policy-2018-2019-FINAL.pdf`

Grievance Procedures
UIC is committed to the most fundamental principles of academic freedom, equality of opportunity, and human dignity involving students and employees. Freedom from discrimination is a foundation for all decision making at UIC. You as students are encouraged to study the University's "Nondiscrimination Statement". You are also urged to read the document "Public Formal Grievance Procedures". Information on these policies and procedures is available on the University web pages of the Office of Access and Equity: `www.uic.edu/depts/oae`. If you choose to submit an academic grievance, you may find the paperwork here:
`https://dos.uic.edu/student-assistance/academic-concerns/academic-grievances/`.

12 University Resources

University Resources: Students with Disabilities

- UIC is committed to full inclusion and participation of people with disabilities in all aspects of university life. Students who face or anticipate disability-related barriers while at UIC should connect with the Disability Resource Center (DRC) at `drc.uic.edu`, or at (312) 413-2183 to create a plan for reasonable accommodations.
- In order to receive accommodations, students must disclose disabilities to the DRC, complete an interactive registration process with the DRC, and provide their course instructor with a Letter of Accommodation (LOA). Course instructors in receipt of an LOA will work with the student and the DRC to implement approved accommodations.
- If you need to book a room with ODS to take an exam, you must submit the online form to ODS no later than a week and a half before the scheduled date of the exam.
- The Disability Resource Center (DRC)'s guide to accommodations may be found here: `http://drc.uic.edu/guide-to-accommodations`.

University Resources: The Math and Science Learning Center
The Math and Science Learning Center, located in the Science and Engineering South Building (SES) at 845 W. Taylor St. 3rd Floor, Room 247, is a meeting place for students in Math, Biological Sciences, Chemistry, Earth and Environmental Sciences, and Physics. At the MSLC, students can meet with graduate teaching assistants for tutoring in 100-level courses, arrange informal group study sessions with other students, or meet up with friends to attend one of the workshops, seminars, or other activities sponsored by the MSLC during the semester. Visit the website at `https://mslc.uic.edu/`, call 312-355-4900 or email at mslc@uic.edu.

University Resources: Academic Center for Excellence
The Academic Center for Excellence can help if you feel you need more individualized instruction in reading and/or writing, study skills, time management, etc. Phone: (312) 413-0031.

University Resources: Counseling Services
Counseling Services are available for all UIC students. You may seek free and confidential services from the Counseling Center `www.counseling.uic.edu`. The Counseling Center is located in the Student Services Building; you may contact them at (312) 996-3490. In addition to offering counseling services, the Counseling Center also operates the InTouch Crisis Hotline from 6:00 p.m.-10:30 p.m. They offer support and referrals to callers, as well as telephone crisis interventions; please call (312) 996-5535.

University Resources: Campus Advocacy Network
Under the Title IX law you have the right to an education that is free from any form of gender-based violence and discrimination. Crimes of sexual assault, domestic violence, sexual harassment, and stalking are against the law and can be prevented. For more information or for confidential victim-services and advocacy contact UICs Campus Advocacy Network at 312-413-1025 or visit `http://can.uic.edu/`. To make a report to UICs Title IX office, email TitleIX@uic.edu or (312) 996-5657.

University Resources: Student Athletes

- During the first week of class, you should provide the instructor with your missed class letter.
- It is the students' responsibility to attend all of their classes. If an athlete knows beforehand that they will be absent on a certain day (i.e. due to a contest), notify the instructor in advance. It is the student-athlete's responsibility to arrange to complete any missed work.

University Resources: Religious Holidays

- Students who wish to observe their religious holidays shall notify the faculty member by the **tenth day of the semester** of the date(s) when they will be absent unless the religious holiday is observed on or before the tenth day of the semester. In such cases, the student shall notify the faculty member at least five days in advance of the date when they will be absent.
- The faculty member shall make every reasonable effort to honor the request, not penalize the student for missing the lass, and if an examination or project is due during the absence, give the student an exam or assignment equivalent to the one completed by those students in attendance.
- If the student feels aggrieved, they may request remedy through the campus grievance procedure.
- UIC religious holiday calendar: `http://oae.uic.edu/religious-calendar`

13 Tentative Course Schedule

Week	Section	Topics
1 8/23/21	1.1-1.7 2.1	Syllabus and Introduction Types and Framework of Probability Sampling
2 8/30/21	2.2–2.5	Simple Random Sampling; Sample Weights Sample Confidence Interval
3 9/6/21	2.6–2.8 **Written HW**	**Monday: Labor Day - No Class / No Office Hours** Sample Size Estimation; Systematic Sampling; Randomization **Wednesday: Homework 1 Sections 1.1–2.4 due**
4 9/13/21	2.9–3.2	Prediction for SRS and Application of SRS Theory of Stratified Sampling
5 9/20/21	3.3–3.6 **Written HW**	Sampling Weights; Allocating Observations to Strata Inference for Stratified Sampling **Wednesday: Homework 2 Sections 2.5–2.10 due**
6 9/27/21	3.7–4.2 **Written HW**	Quota Sampling; Ratio Estimation Estimation in Domains **Friday: Homework 3 Sections 3.1–3.7 due**
7 10/4/21	4.3–4.6	Regression in SRS; Poststratification Model-Based Theory
8 10/11/21	5.1–5.2 **Exam** **Written HW**	One-Stage Cluster Sampling Wednesday: Review Day **Friday: Exam 1 (Chapters 1–4)** **Wednesday: Homework 4 Sections 4.1–4.6 due**
9 10/18/21	5.3–5.6	Two-Stage Cluster Sampling; Systematic Sampling Model-Based Inference
10 10/25/21	6.1–6.4 **Written HW**	One- and Two-Stage Sampling with Replacement Unequal-Probability Sampling without Replacement **Wednesday: Homework 5 Sections 5.1–5.6 due**
11 11/1/21	6.5–6.7	Unequal-Probability Samples; Randomization Theory Model and Unequal-Probability Sampling
12 11/8/21	7.1–7.4 **Written HW**	Assembling design components; Sampling Weights Estimating a Distribution Function **Wednesday: Homework 6 Sections 6.1–6.7 due**
13 11/15/21	7.5–7.7	Design Effects Sampling and Design of Experiments
14 11/22/21 **Written HW**	8.1–8.4	Effects of ignoring nonresponse Design surveys to reduce nonsampling errors **Friday: Thanksgiving - No Class / No Office Hours** **Wednesday: Homework 7 Sections 7.1–7.7 due**
15 11/29/21	8.5–8.8	Weighting methods for non-response; Imputation Parametric Models
16 Finals Week	**Exam**	**Exam 2** **Friday December 10 (10:30 am – 12:30 pm)**