



THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 6802

STATISTICAL THEORY II

SPRING 2023

Course overview

Instructor

Instructor: Radu Herbei

Email address: herbei.1@osu.edu

Office hours: Virtual Hours via Carmen Zoom: Mondays 11:30-12:30pm and by appointment.

Course description

Statistics 6802 is the second half of a two-course sequence on probability theory and statistical inference. As in Statistics 6801, the emphasis is on a fairly rigorous theoretical development of the modeling and inferential tools needed in statistical practice and research.

Course learning outcomes

An important course objective is for the students to become comfortable with the formulation, conceptualization, and execution of theoretical and methodological ideas, as they relate to sound modeling and data analysis practice.

The course will cover selected topics from Chapter 7 (Point Estimation), 8 (Hypothesis Testing), 9 (Interval Estimation), and 10 (Asymptotic Evaluation) of the textbook. A more detailed, tentative course plan is provided at the end of this document.

Course materials

Required

[CB] *Statistical Inference* by Casella, G. and Berger, R.L., Cengage Learning. [[Link](#)]

Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Carmen

Technology skills necessary for this specific course

- CarmenZoom
- Collaborating in CarmenWiki
- Recording a slide presentation with audio narration
- Recording, editing, and uploading video

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 10+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in laptop or tablet mic or external microphone

Necessary software

- [Microsoft Office 365 ProPlus](#) All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Each student can install Office on five PCs or Macs, five tablets (Windows, iPad® and Android™) and five phones.

- Students are able to access Word, Excel, PowerPoint, Outlook and other programs, depending on platform. Users will also receive 1 TB of OneDrive for Business storage.
- Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found <https://ocio.osu.edu/kb04733>.
- Although this class is mostly theoretical, on occasion, I may use the statistical software package called R (The R Project for Statistical Computing; <http://www.r-project.org/>) to illustrate certain aspects. However, this software is not a strict requirement for this class. If you wish to download it, here is the information.
 - You can download R for Windows, Mac, and Linux, from the CRAN archive at <https://cran.r-project.org>.
 - An in-depth introduction to R is available at <http://cran.r-project.org/doc/manuals/R-intro.pdf>
 - Hands-on tutorials are available in the Swirl system, which you can learn about at <http://swirlstats.com/>. In particular, “R Programming: The basics of programming in R” is an appropriate first tutorial for students who have never used R.
- An easier to use interface to R is available in the software package RStudio. This package is available for Windows, Mac, and Linux and can be downloaded for free from posit.co.
Note that RStudio requires R to be installed.

Course delivery

The class meets on MWF from 8:50am – 10:05am in EC0218. The class is offered **in-person**. Unless mandated by the University, the class will not have a parallel online content-delivery system. At the instructor’s discretion, certain lectures may be recorded and/or delivered online only.

The instructor will hold weekly office hours via CarmenZoom as indicated above. When appropriate, the instructor will also initiate and manage active discussion boards, also via Carmen.

Grading and faculty response

Grades

| Assignment or category | Percentage |
|-------------------------------------|------------|
| In-class participation | 10% |
| 7 x In-class assessments (10% each) | 70% |
| Final Exam | 20% |
| TOTAL | 100% |

Assignment information

Homework: I will not assign and collect homework for grading purposes. At the end of each Chapter, the textbook contains a collection of practice problems. Students are encouraged to attempt these problems in preparation for in-class assessments and exams.

In-class participation. Students are expected to attend each class and participate in the discussion (ask and answer questions, share opinions, etc.). I will take attendance on a random basis. If you'll miss a class, I hope that you will send me a short note, to let me know.

In-class assessments: We will have regular (every two weeks) in-class assessments. These will take roughly 30 minutes and will be slightly longer than a quiz, but less than an exam. Each assessment will contain 2-3 problems on the topics covered in class most recently. The tentative dates for these assessments are:

A1: January 18, 2023.
 A2: February 1, 2023.
 A3: February 15, 2023.
 A4: March 1, 2023.
 A5: March 22, 2023.
 A6: April 5, 2023.
 A7: April 19, 2023.

Final Exam: The Final Exam is scheduled for **Friday, April 28, 10:00am – 12:00pm**. The final exam is comprehensive. More information will be communicated well in advance during class and through the course website. If mandated, exams and assessments will be delivered online, through Carmen. For online exams, **Proctorio** may be used as a security tool.

Late assignments

Generally, **written documentation is required** for missed assessments and exams. If you are unable to come to class to take an assessment, please get in touch with me *as soon as possible* so we can discuss your situation.

Grading scale

93–100: A
 90–92.9: A-
 87–89.9: B+
 83–86.9: B
 80–82.9: B-
 77–79.9: C+
 73–76.9: C
 70–72.9: C-
 67–69.9: D+
 60–66.9: D
 Below 60: E

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

Grading and feedback

For the bi-weekly assessments, you can generally expect feedback within **7 days**.

E-mail

I will reply to e-mails within **24 hours, on school days**.

Discussion board

I will check and reply to messages in the discussion boards every **24 hours, on school days**.

Attendance, participation, and discussions

Student participation requirements

The following is a summary of everyone's expected participation:

- Since the class is offered in-person, students are required to attend class **in person**.
- **Logging in to Carmen: AT LEAST ONCE PER WEEK**
 Be sure you are logging in to the course in Carmen each week, including weeks with holidays or weeks with minimal course activity. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.

- **Office hours: OPTIONAL OR FLEXIBLE**
My office hours, are optional. If you wish to discuss an assignment with me, please contact me if you need a time outside my scheduled office hours.
- **Participating in discussion forums: OPTIONAL, SEVERAL TIMES PER WEEK**
You are encouraged to participate in discussion forums, if you choose to do so.

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While there is no need to participate in discussion forums as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. Informality (including an occasional emoticon) is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Other course policies

Health and safety

The Ohio State University Wexner Medical Center's CORONA virus Outbreak site (<https://wexnermedical.osu.edu/features/coronavirus>) includes the latest information about COVID-19 as well as guidance for students, faculty and staff.

I expect that you will read and follow the guidelines and requirements for campus safety, which are available at <https://safeandhealthy.osu.edu>.

Student academic services

Student academic services offered on the OSU main campus
<http://advising.osu.edu/welcome.shtml>.

Student support services

Student support services offered on the OSU main campus <http://ssc.osu.edu>.

Academic integrity policy

Policies for this online course

- **Exams:** You must complete exams yourself, without any external help or communication.
- **Written assignments:** Your written assignments, including discussion posts, should be *your own original work*. You are encouraged to join a study group and *discuss* homework problems with your peers. You are also encouraged to ask a trusted person to proofread your assignments before you turn them in--but no one else should revise or rewrite your work.
- **Reusing past work:** In general, you are prohibited, in university courses, from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- **Falsifying research or results:** All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- **Collaboration and informal peer-review:** The course includes opportunities for collaboration with your classmates. While study groups are encouraged, remember that you must submit your own original work. If you're unsure about a particular situation, please feel free just to ask ahead of time.

Ohio State's academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course. You must obtain my permission before sharing any of the materials associated with this course with others not enrolled in the class.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

Accessibility accommodations for students with disabilities

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; <http://slds.osu.edu>; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- [Carmen \(Canvas\) accessibility](#)
- Streaming audio and video
- Synchronous course tools

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other

concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at suicidepreventionlifeline.org

Student Advocacy Center

If you find yourself in a challenging situation and wish to discuss it with an advocate, please visit <https://advocacy.osu.edu/>

Disclaimer

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and, in particular, I reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.

Tentative Schedule

| Week | Dates | Topics, Readings, Assignments, Deadlines |
|------|-------------------|--|
| 1 | 1/9/23 – 1/15/23 | Point Estimation. Method of Moments. MLEs |
| 2 | 1/16/23 – 1/22/23 | Bayes Estimators, Evaluating Estimators, MSE, Unbiasedness. |
| 3 | 1/23/23 – 1/29/23 | Best Unbiased, Cramer-Rao, Fisher Information, Rao-Blackwell |
| 4 | 1/30/23 – 2/5/23 | Properties of UMVUEs, Completeness, Review of convergence concepts |
| 5 | 2/6/23 – 2/12/23 | Asymptotic evaluations, consistency, efficiency |
| 6 | 2/13/23 – 2/19/23 | Elements of decision theory |
| 7 | 2/20/23 – 2/26/23 | Hypothesis testing |
| 8 | 2/27/23 – 3/5/23 | LRT examples, sufficiency, Bayesian tests, Power function |
| 9 | 3/6/23 – 3/12/23 | Most powerful tests, Neyman-Pearson |
| 10 | 3/20/23 – 3/26/23 | P-values, Fisher's Exact test |
| 11 | 3/27/23 – 4/2/23 | UMP unbiased tests, Generalized Neyman-Pearson |
| 12 | 4/3/23 – 4/9/23 | Large sample tests |
| 13 | 4/10/23 – 4/16/23 | Interval Estimation, Inverting tests, Pivoting |
| 14 | 4/17/23 – 4/24/23 | Coverage and size, test-related optimality, Prediction |