

## Course Overview

### Instructor Information

Instructor: Thomas Metzger, PhD

Email: [metzger.181@osu.edu](mailto:metzger.181@osu.edu); **please do not use my Buckeyemail address.** Messages sent through Carmen often go into my spam folder; for fastest communication, use [metzger.181@osu.edu](mailto:metzger.181@osu.edu).

Office hours: Tuesday 11:30 am - 12:30 pm, Zoom; or by appointment

Grader/TA: Mr. Alan Gan, [gan.171@osu.edu](mailto:gan.171@osu.edu)

### Course Delivery

All students: Asynchronous lecture videos will be posted in advance that you must watch on your own time before the required deadline. When watching these videos, it is important that you treat them as you would an in-person course: view them without distractions, and work along by taking notes and coding along with the video.

Asynchronous Recitation: Recitations will be held Mondays TBD virtually. Attendance is optional but encouraged. The sessions will be recorded and posted to Carmen Monday by the evening. Students should review the recording on their own time as a supplement to each week's lab activity. Additionally, the TA will host an optional in-person office hour TBD.

The purpose of office hours is to provide supplemental time for questions, discussion, or assistance that you may need. Any topics related to the course, or to college life, professional development, or personal issues affecting your academic career at Ohio State are relevant and welcome topics. Office hours will be Mondays and Wednesdays 10:30-11:30. A Zoom link can be found on Carmen for virtual meetings. Office hour attendance is always optional but you are welcome to attend as frequently as you would like.

### Course Description

Foundational inferential methods for learning about populations from samples, including point and interval estimation, and the formulation and testing of hypotheses. Statistical theory is introduced to justify the approaches. The course emphasizes challenges that arise when applying classical ideas to big data, partially through the use of computational and simulation techniques. Prereq: C- or better in 3201, or permission of instructor. Not open to students with credit for 4202.

### Course Learning Outcomes

By the end of this course, students should successfully be able to:

- Compare the performance of estimators via bias, mean squared error, consistency, and sufficiency

- Use Monte Carlo simulation to model the performance of estimators and testing procedures
- Propose estimators via the method of moments and maximum likelihood estimation
- Use the Central Limit Theorem to model the sample distribution of a sample mean
- Conduct hypothesis tests on mean and variance parameters, including t-tests, chi-square tests, and F tests
- Determine and interpret the power and type-II error of a test
- Use bootstrapping to conduct inference
- Perform nonparametric hypothesis tests on mean parameters

## Materials

### Text

- Required text: Stat 3202 Course Notes (electronic, on Carmen)
- Recommended text: Mathematical Statistics with Applications, 7th edition, by Wackerly, Mendenhall, and Scheaffer, Brooks/Cole, Cengage Learning, 2008. eBook PDFs are much cheaper and are highly encouraged.

### Software

- Required software: we will extensively use the statistical software package called R (The R Project for Statistical Computing; <http://www.r-project.org/>). This software package is available for free. 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>. Tutorials are available in the Swirl system, which you can learn about at <http://swirlstats.com/>. “R Programming: The basics of programming in R” is an appropriate first tutorial for students who have never used R.
- Required software: we will also use the R interface RStudio. This package is available for Windows, Mac, and Linux and can be downloaded for free from <http://rstudio.org>. Note that RStudio requires R to be installed.
- Required 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>.

## Grades and Assignments

### Homework (15%)

Homework assignments will comprise 15% of your grade for the course. Assignments will only be accepted through Carmen as a .pdf file submission, with clear and organized work and relevant code and output provided. Every assigned problem should be completed, but

only a subset of problems may be graded. You are encouraged to collaborate remotely on homework assignments, but ultimately the work you submit must be your own. You may be asked to explain and defend your work. **All homework assignments will be included in your final grade.**

### Labs (15%)

Lab assignments will comprise 15% of your grade for the course. Most weeks a lab assignment will be introduced during recitation, incorporating recent lecture topics with coding. Labs will generally be due Fridays before 11:59 pm. You are encouraged to collaborate on lab assignments, but ultimately the work you submit must be your own. Labs must be completed in R Markdown and must be compiled into organized, professional PDF documents. Relevant plots should be included and labeled, code should be organized and clear, and supporting answers and text should be properly formatted and professionally written. You may be asked to explain and defend your work. The lowest lab grade will be dropped.

### Content Quizzes (15%)

The purpose of these assignments is to ensure you are keeping on schedule with the videos and to assess the content of the videos. Feel free to use your notes, rewatch videos, and retake them a second time. These short assignments should be completed by the assigned deadline. The lowest content quiz grade will be dropped. Videos and content quizzes will typically be available a week in advance to give you a chance to work ahead if you have personal obligations.

### Oral Exams (45%)

Three oral exams, each comprising 15% of your grade, will take place during the semester: oral exam 1, approximately covering videos 1-20, will take place Week 4 by appointment. Oral exam 2, approximately covering videos 21-43, will take place Week 8 by appointment. Oral exam 3, approximately covering videos 44-70, will take place during final exam week (Monday, July 28 - Wednesday, July 30) by appointment. Oral exams will last about 10 minutes. Students are welcome to use their notes during these exams but they cannot communicate with others or use AI tools. I will typically have flexibility within a day before or after these dates to accommodate students who are unavailable on these specific dates - please reach out ahead of time for flexibility! All exam grades will count towards your final grade.

### Late Assignments

It is imperative to stay on schedule for this condensed, 12 week course. Late homeworks, labs, and Carmen quizzes will be accepted for 48 hours after the original due date with a 2% deduction per hour. **After this, no late assignments will be accepted.** Do not wait until the last moment to begin working on assignments. Unexpected obstacles will occur in life - it is your responsibility to be prepared for them. If something unexpected comes up 2

hours before an assignment is due that impedes your ability to submit on time, then you should have started the assignment earlier. Submitting the wrong document - such as the blank assignment template, an incomplete version, or a corrupted version of the file - is not a valid excuse. It is your responsibility to ensure you have submitted the proper document in the proper format.

For an emergency, each student can have one late waiver throughout the semester, no questions asked. **You still have to turn in the assignment within 48 hours, but I'll waive the late penalty for one assignment of your choosing if something unexpected comes up and submit it within 48 hours of the due date.** You can request the waiver any time, but you must contact me in writing to let me know which assignment you'd like your late waiver for no later than Friday, July 25, 2025.

## Academic Integrity

I take academic integrity very seriously. There is no place at The Ohio State University for academic misconduct, and I have submitted many students in the past for violations including copying other students' work and receiving unauthorized assistance on exams.

- Content quizzes: you are encouraged to collaborate with other students in small groups if you are comfortable doing so, but ultimately the work you submit must be your own. Directly copying another student's work is not permitted. AI tools such as ChatGPT are permitted to summarize ideas or provide context, but you may not copy answers directly.
- Labs: you are encouraged to collaborate on lab assignments, but ultimately the work you submit must be your own. Directly copying another student's code, work, or file is not permitted. AI generated code is not acceptable.
- Oral exams: you may use your own personal notes during oral exams, but be careful to not be too reliant on these resources. You may not use AI tools such as ChatGPT during these assignments.
- 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 many opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on an exam is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.

**Artificial intelligence tools: AI is not permitted to generate code, find solutions, or solve problems. Submitted work may be screened for suspected AI and submitted to COAM if necessary.**

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/>.

## Health, Safety, and Accommodations

In the event you are unable to attend class for an extended period of time, please reach out to me as soon as possible. If it is reasonable for you to continue participating remotely, all materials will remain accessible for you. In the event I am unable to participate for an extended period of time, I will let students know as soon as possible. A replacement instructor will be available through the Department of Statistics.

If a health issue prevents you from participating in course material for multiple days, please obtain documentation from a health care provider, Student Advocacy, or SLDS.

## Title IX Policy

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 at [titleix@osu.edu](mailto:titleix@osu.edu).

## Student Services and Accessibility Accommodations for Students with Disabilities

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. 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.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; or [slds.osu.edu](http://slds.osu.edu).

## Diversity and Inclusion

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

## Religious Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions

or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.

## 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](http://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](http://suicidepreventionlifeline.org).

## 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.

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 we 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.