

Statistical Theory II

STAT 6802 Spring 2022

Course Information

- **Course times and location:** MWF 8:50am – 10:05am in Caldwell Lab 220
- **Credit hours:** 4
- **Mode of delivery:** In-Person (P)

This course is designed to be in-person. If circumstances force a change, students will be provided with comprehensive details about how to complete all components of the course. If anything is unclear at any point in the semester, please contact the instructor for clarification.

Instructor



- **Name:** Vincent Q. Vu
- **Email:** vu.104@osu.edu
- **Office location:** 428B Cockins Hall
- **Office hours:** Tuesdays and Thursdays 11:00am – 12:00pm via CarmenZoom (link in CarmenCanvas), or by appointment via CarmenZoom.
- **Preferred means of communication:**
 - My preferred method of communication for questions is **email**.
 - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your [notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Teaching Assistant

- **Name:** Amartya Ghosh
- **Email:** ghosh.147@osu.edu

Course Prerequisites

STAT 6801 or permission of instructor.

Course Description

Statistics 6802 is the second half of a two-course sequence on probability 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.

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 6 (Principles of Data Reduction), 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 and Technologies

The primary resource for reading will be slides and additional references assigned for reading by the instructor. There is one required book for the course that will be used for the parts of course dealing with data manipulation and visualization in R:

Required Materials

- **[CB]** Casella, G. and Berger, R.L., "Statistical Inference," 2nd. edition. Cengage Learning (print)

Required Equipment

- **Computer:** current Mac (macOS) or PC (Windows or Linux) with high-speed internet connection
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication.

CarmenCanvas Access

You will need to use [BuckeyePass](https://buckeyepass.osu.edu) (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the [BuckeyePass - Adding a Device](https://go.osu.edu/add-device) (go.osu.edu/add-device) help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- [Install the Duo Mobile application](https://go.osu.edu/install-duo) (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at [614-688-4357 \(HELP\)](tel:614-688-4357) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- [Navigating CarmenCanvas](https://go.osu.edu/canvasstudent) (go.osu.edu/canvasstudent)
- [CarmenZoom virtual meetings](https://go.osu.edu/zoom-meetings) (go.osu.edu/zoom-meetings)



Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat:** go.osu.edu/it
- **Phone:** [614-688-4357 \(HELP\)](tel:614-688-4357)
- **Email:** servicedesk@osu.edu

Grading and Faculty Response

How Your Grade is Calculated

Assignment Category	Percentage
Homework	20% (lowest score dropped)
Quizzes	20% (lowest score dropped)
Midterm exam 1	20%
Midterm exam 2	20%
Final exam	20%

Assignment Information

Homework

Homeworks will generally be assigned and due Mondays on a weekly basis. Assignments will be collected in-class, but if you are unable to attend class on the due date you may submit your assignment via CarmenCanvas. Homework is **not** accepted by email.

Quizzes and Exams

Short 30 minute quizzes will be given regularly in-class on most Fridays. There will be two in-class midterm exams, tentatively scheduled for February 14 and March 28, and a final exam, tentatively scheduled for April 29, 10:00am–11:45am.

Academic integrity and collaboration: You are encouraged to work together on the homework, but do not copy any part of a homework. Each student must produce his/her own homework submission. All quizzes and exams are **closed book/closed** notes and to be completed individually without communicating with others. There are no make-up exams.

Late Assignments

If you absolutely need turn in an assignment late and have a valid excuse, please see me for the necessary arrangements. However, you must notify me in advance in such a situation.

Exceptions to this policy will be permitted only in extreme situations such as serious injury immediately prior to an assignment being due or severe illness requiring hospitalization.

Grading Scale

Final grades will be assigned on the basis of performance in the course. The grades will not be lower than those in the “straight scale” of 90% for an A, 80% for a B, 70% for a C and so on. The quizzes and exams will contain some difficult problems, and it is likely that the cutoffs will be lower than this traditional scale.

Instructor 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 [614-688-4357 \(HELP\)](tel:614-688-4357) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact me first through my Ohio State email address. I will reply to emails within **24 hours on days when class is in session at the university**.
- **Class announcements:** I will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check [your notification preferences](http://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Grading and feedback:** For homework assignments, you can generally expect feedback and grades within **7-10 days**.



Other Course Policies

Attendance

The class is designed around the lectures. Attendance is strongly encouraged as is class participation. If you have questions, ask in class or see me after class or during office hours.

If you are unable to attend due to COVID-19 or for other reasons, please let me know right away. If you test positive for the virus or believe that you have symptoms, it is best that you take care of health concerns before worrying about this class. Let me know of the situation promptly and we will make special arrangements (see also below).

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; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Academic Integrity Policy

See [Descriptions of Major Course Assignments](#) for specific guidelines about collaboration and academic integrity in the context of this online class.

Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's [Code of Student Conduct](http://studentconduct.osu.edu) (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct,

so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- [Committee on Academic Misconduct](http://go.osu.edu/coam) (go.osu.edu/coam)
- [Ten Suggestions for Preserving Academic Integrity](http://go.osu.edu/ten-suggestions) (go.osu.edu/ten-suggestions)
- [Eight Cardinal Rules of Academic Integrity](http://go.osu.edu/cardinal-rules) (go.osu.edu/cardinal-rules)

Copyright for Instructional Materials

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.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,

2. Call 614-247-5838 or TTY 614-688-8605,
3. Or email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

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. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, [on-demand mental health resources](http://go.osu.edu/ccsondemand) (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at [614- 292-5766](tel:614-292-5766). **24-hour emergency help** is available through the [National Suicide Prevention Lifeline website](http://www.nationalsuicideline.org) (suicidepreventionlifeline.org) or by calling [1-800-273-8255\(TALK\)](tel:1-800-273-8255). [The Ohio State Wellness app](http://go.osu.edu/wellnessapp) (go.osu.edu/wellnessapp) is also a great resource.

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 at titleix@osu.edu

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. 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 \(SLDS\)](#). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. 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.

Disability Services Contact Information

- Phone: [614-292-3307](tel:614-292-3307)
- Website: slds.osu.edu
- Email: slds@osu.edu
- In person: [Baker Hall 098, 113 W. 12th Avenue](#)

Accessibility of Course Technology

This online course requires use of CarmenCanvas (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 as early as possible.

- [CarmenCanvas accessibility](http://go.osu.edu/canvas-accessibility) (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- [CarmenZoom accessibility](http://go.osu.edu/zoom-accessibility) (go.osu.edu/zoom-accessibility)

Course Schedule (tentative)

Refer to the CarmenCanvas course site for up-to-date information.

Dates	Week	Topics, Readings, Assignments Due
1/10– 1/14	1	Topic: Point estimation: Method of moments, maximum likelihood Reading: CB 7.1–7.2.2
1/19– 1/21	2	Topic: Bayes estimators; Evaluating estimators: MSE and unbiasedness Reading: CB 7.2.3, 7.3–7.3.1 Assignments: Quiz 1 (No class 1/17)
1/24– 1/28	3	Topic: Evaluating estimators: Best unbiased, Cramér–Rao, Fisher information, Sufficiency and unbiasedness, Rao–Blackwell Reading: CB 7.3.2–7.3.3 Assignments: Homework 1 due, Quiz 2
1/31– 2/4	4	Topic: Evaluating estimators: Properties of UMVUEs, Completeness and Lehmann–Scheffé; Review of convergence concepts Reading: CB 7.3.3, 5.5 Assignments: Homework 2 due, Quiz 3
2/7– 2/11	5	Topic: Asymptotic evaluations: Consistency, efficiency, calculations/comparisons Reading: CB 10.1–10.1.3 Assignments: Homework 3 due
2/14– 2/18	6	Topic: Elements of decision theory Reading: CB 7.3.4 Assignments: Midterm Exam 1
2/21– 2/25	7	Topic: Hypothesis testing: Definitions and Likelihood Ratio Tests Reading: CB 8.1–8.2.1 Assignments: Homework 4 due, Quiz 4
2/28– 3/4	8	Topic: Hypothesis testing: LRT examples, LRT and sufficiency, Bayesian tests, Error probabilities and power functions Reading: CB 8.2.1, 8.3.1 Assignments: Homework 5 due, Quiz 5



Dates	Week	Topics, Readings, Assignments Due
3/7–3/11	9	<p>Topic: Hypothesis testing: Most powerful tests, Neyman–Pearson, Karlin–Rubin</p> <p>Reading: CB 8.3.2</p> <p>Assignments: Homework 6 due, Quiz 6</p>
3/14–3/18	10	<p>Spring Break: No class</p>
3/21–3/25	11	<p>Topic: Hypothesis testing: p-values, Fisher’s exact test</p> <p>Reading: CB 8.3.4</p> <p>Assignments: Homework 7 due</p>
3/28–4/1	12	<p>Topic: Hypothesis testing: UMP unbiased tests, Generalized Neyman–Pearson</p> <p>Reading: CB 8.3.2</p> <p>Assignments: Midterm Exam 2</p>
4/4–4/8	13	<p>Topic: Large sample tests: LRT, Wald tests, Score tests</p> <p>Reading: CB 10.3–10.3..2</p> <p>Assignments: Homework 8 due, Quiz 7</p>
4/11–4/15	14	<p>Topic: Interval estimation: Coverage probability, Inverting tests, Pivoting, Bayesian intervals</p> <p>Reading: CB 9.1, 9.2–9.2.4</p> <p>Assignments: Homework 9 due, Quiz 8</p>
4/18–4/22	15	<p>Topic: Evaluating interval estimators: Coverage and size, test-related optimality; Prediction intervals</p> <p>Reading: CB 9.3–9.3.2</p> <p>Assignments: Homework 10 due, Quiz 9</p>
4/25	16	<p>Topic: Final review</p> <p>Assignments: Homework 11 due</p>
4/29		<p>Final Exam: 10:00am – 11:45am</p>