Syllabus: STAT 6801

Statistical theory I

Autumn 2025

Course overview

## Instructor

Instructor: Steve MacEachern

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Office hours: Monday, 11:30 – 12:30; Friday 10:30 – 11:30; and by appointment

Office Location: 440D Cockins Hall

## Grader or Teaching Assistant

Grader: Qian Zhou

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Office hours: Wednesday, 1:30 – 2:30

Office location: MA 422 (Math Building) and on zoom at https://osu.zoom.us/j/99187580611?pwd=zU11Lfym1y1rkQJPnjvgZYipb56Hdd.1

 (password is 235805)

## Course description

## This is the first course in a two-semester sequence on probability and theoretical statistics. The course is required for the MS and PhD in Statistics and for the PhD in Biostatistics. In it, we will cover the basics of probability, random variables, common distributions, distribution theory, concepts of convergence, and we will get a start on principles of inference.

## Course materials

### Required

Statistical Inference (2nd Edition), by George Casella and Roger Berger.

### Additional sources

There are many good books on Statistical Theory. Casella and Berger takes a mathematical approach to the subject. Others are a bit softer mathematically but have a more lucid description of the central concepts. Two of my favorites along these lines are Statistical Theory by Bernie Lindgren (Third Edition) and Probability and Statistics by Morrie DeGroot (1st or 2nd edition, not the revised version with Schervish). The old classic, Mathematical Methods of Statistics, by Harald Cramer, is dated but wonderful. It is sharp, correct, and at a high mathematical level.

These older books are widely available. You may find them in the library or at a bargain price on the internet.

## Course delivery

This course is designed to be in person. In the event that circumstances force a change, we will adapt. Details of the adaptation will depend on the circumstances.

# Grading

## Grades

Your numerical grade for this course will be computed on the basis of:

 Homework Assignments – 15%

 Midterm Exams (two) – 50%

 Final Exam – 35%

Your two lowest homework scores will be dropped before computing your homework grade. If you miss a homework assignment, you will receive a zero for the assignment (likely one that you will drop).

**Assignment information**

The reading assignments will not be graded. But read the book. It’s a good one.

You will have homework assignments at a pace of roughly one assignment per week. The baseline expectation is for you to spend two hours outside of class on this course for each nominal hour in class. Depending on your background and the pace at which you work, your actual time may be longer or shorter than this expectation.

Homework assignments will contain a mix of problems from the textbook and additional problems. The assignments will be available on Carmen. Solutions to the assignments will be available after the assignments are due.

The midterm exams will be closed book, closed notes. Each exam will take one class period. Tentative dates for the exams are Monday, October 6 and Friday November 14. These dates are tentative. They may change, depending on the pace of lectures.

The final exam is closed book, closed notes. It will take place as scheduled by the university registrar. The date of the exam is Monday, December 15, from 10:00 AM to 11:45 AM. The exam will be held in the regular classroom.

## Late assignments

Assignments will be due, in class, in hard-copy format. The choice of format is to make grading more efficient and to make it easier to provide you with feedback. For late assignments, one (business) day late is a deduction of 10%; two days late, of 20%; beyond two days late, the assignment will not be accepted.

## Grading scale

Final grades will be assigned on the basis of performance in the course. The letter grades will not be lower than those based on the “straight scale” of 90% for an A, 80% for a B, 70% for a C and so on. The exams will contain some difficult problems. I expect the cutoffs to be lower than those from the straight scale.

Simple numerical calculation will typically translate directly to your grade. In some circumstances, I may adjust grades upward.

# Attendance and tentative schedule

The class is designed around the lectures. Attendance is strongly encouraged as is class participation. Over time, I have tracked the performance of regular class attenders and non-attenders. There is a substantial difference in performance for these two groups. Show up, read the book, do the homework (and a bit more, if time and inclination permit), and you will do well in class. If you have questions, ask in class or see me after class or during office hours.

If you are unable to attend due to illness or for other reasons, let me know. If, for example, you test positive for COVID 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.

# Tentative Course schedule

There are nominally 14 weeks in the semester, but the lectures are spread over 16 weeks. The plan below is tentative. Expect departures from the rough guide below as we spend a little more time or a little less time on particular parts of the material. We will cover some material that is not in the text.

For details of assignments, see Carmen. Reading assignments follow. All are from Casella and Berger.

Week 1: sections 1.1-1.2.2

Week 2: sections 1.2.3-1.4

Week 3: sections 1.5-1.6

Week 4: sections 2.1-2.3

Week 5: sections 2.3-2.4

Week 6: sections 3.1-3.3

Week 7: sections 3.4-3.5

Week 8: sections 3.6; 3.8.1, part of 3.8.2

Week 9: sections 4.1-4.2

Week 10: sections 4.3-4.4

Week 11: sections 4.5-4.7

Week 12: sections 5.1-5.2

Week 13: sections 5.3-5.5

Week 14: sections 6.1-6.2

Weeks 15-16: section 6.3

# Other course policies – specific to this course

## Potential disruptions to instruction

The planned instruction for this course may be disrupted for a number of reasons. Such disruptions may affect individual students for a brief period of time, the entire class, the instructor, or the entire university. If the class is disrupted, we will adjust as needed. The adjustments may include changes to course delivery, assignments, grading of assignments, and determination of final course grade.

## Student support services

A robust set of student support services is available to students at The Ohio State University. Information on student support services is available at <https://studentlife.osu.edu>.

## Academic integrity policy

### The main purpose of this course is for you to learn the material and to increase your understanding of Statistics. For the homework assignments, you can talk with fellow students and you can work on the problems with them. You may even wish to look on the web or use AI tools when working on the homework. This is acceptable, but your write-up should be your own – not a direct copy of a classmate’s work, of a solution found online, or a write-up produced by AI. The exams will be in-class. For them, you will work solely on your own, so make sure that you have command of the material. For exams, a basic calculator will be permitted but cell phones will not be permitted. Tables will be provided as needed.

Note that this policy of open discussion and use of AI on the homework is specific to this course. Other instructors and other courses may well have a different policy. Make sure that you understand the policy for each course that you take.

Also note: this is one class in the MS / PhD curriculum. The curriculum has been designed to give you the breadth of skills and knowledge needed to function as an effective professional statistician / biostatistician / data scientist. In addition to individual courses, to progress to a degree, you must take (and pass) a comprehensive examination or two that covers much of the curriculum. The best route to success in the program – and for your future career – is to absorb much from the courses while taking them and to then fill in gaps in knowledge when studying for the comprehensive exams.

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. I will report serious academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

# Standard syllabus statements

## Academic Misconduct

## 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](https://oaa.osu.edu/resources/policies-and-procedures/committee-academic-misconduct) (COAM) expect that all students have read and understand the University's [Code of Student Conduct](https://trustees.osu.edu/bylaws-and-rules/code), 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 please review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

## If an instructor suspects that a student has committed academic misconduct in this course, the instructor is obligated by University Rules to report those suspicions to the Committee on Academic Misconduct. If COAM determines that a student violated the University’s Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University.

## If students have questions about the above policy or what constitutes academic misconduct in this course, they should contact the instructor.

## Artificial Intelligence and Academic Integrity

## There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite, and others. These tools will help shape the future of work, research and technology, but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

## All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use unauthorized assistance in the laboratory, on field work, in scholarship, or on a course assignment unless such assistance has been authorized specifically by the course instructor. In addition, students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing of writing, ideas or other work that is not your own. These requirements apply to all students undergraduate, graduate, and professional.

## To maintain a culture of integrity and respect, these generative AI tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use. Some instructors may approve of using generative AI tools in the academic setting for specific goals. However, these tools should be used only with the explicit and clear permission of each individual instructor, and then only in the ways allowed by the instructor.

## 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 Civil Rights Compliance Office.

## Policy: [Religious Holidays, Holy Days and Observances](https://oaa.osu.edu/religious-holidays-holy-days-and-observances)

## Disability Statement (with Accommodations for Illness)

## The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If students anticipate or experience academic barriers based on a disability (including mental health and medical conditions, whether chronic or temporary), they should let their instructor know immediately so that they can privately discuss options. Students do not need to disclose specific information about a disability to faculty. To establish reasonable accommodations, students may be asked to register with Student Life Disability Services (see below for campus-specific contact information). After registration, students should make arrangements with their instructors as soon as possible to discuss your accommodations so that accommodations may be implemented in a timely fashion.

## If students are ill and need to miss class, including if they are staying home and away from others while experiencing symptoms of viral infection or fever, they should let their instructor know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations.

For web contact, see <https://slds.osu.edu/>

**Intellectual Diversity**

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

## Grievances and Solving Problems

## According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, take your case to the department chairperson, college dean or associate dean, and to the provost, in that order. Specific procedures are outlined in Faculty Rule 3335-8-23. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant’s department.

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

## The Ohio State University is committed to building and maintaining a welcoming community. 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 Civil Rights Compliance Office (CRCO):

## Online reporting form: <http://civilrights.osu.edu/>

## Call 614-247-5838 or TTY 614-688-8605

## civilrights@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 Civil Rights Compliance Office 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.

## Copyright

## 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.

## Counseling and Consultation Services / Mental Health Statement

## Columbus:

## 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 by dialing 988 to reach the Suicide and Crisis Lifeline.

## Military-Connected Students

## The [Military and Veterans Services](https://veterans.osu.edu/) (MVS) Office offers a wide range of resources for military-connected students. Whether using educational benefits or not, all military‐connected students are encouraged to learn more about how the university supports military-connected students (i.e., information about tutoring, transition services, access to the veteran’s lounge, etc.). For service members, should you receive military orders during the semester or know of classes that will be missed due to service commitments, please speak with your instructor as soon as possible on possible accommodations. MVS contact information: milvets@osu.edu; 614‐247‐VETS; veterans.osu.edu/; 185 Student Academic Services Building, 281 W. Lane Avenue.

# Parting words

## Disclaimer

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