



# THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

## **SYLLABUS: STAT 6112** **FOUNDATIONS OF STATISTICAL THEORY II** **SPRING 2025**

### Course overview

#### Instructor

Instructor: Dena M. Asta  
Email address: [asta.1@osu.edu](mailto:asta.1@osu.edu)  
Class Website: Carmen  
Lectures: MWF at 12:40-1:35pm in University Hall 086  
Office hours: Tuesday 11:00-12:00pm, Wednesday 1:45pm-2:45pm, and by appointment  
(please schedule appointments at least 24 hours in advance). Office in Cockins Hall 427.

#### Graduate Teacher Assistant

Grader: Xinyu Zhang  
Email address: [zhang.11591@osu.edu](mailto:zhang.11591@osu.edu)

#### Prerequisites

Entry to this course is restricted to graduate standing in the Statistics MS program, Statistics PhD program, or Interdisciplinary Biostatistics PhD program; Or permission of instructor.

#### Course description

Statistics 6112 is the second part of a course that reviews and introduces the mathematical foundations that are necessary for the coursework in the PhD programs in Statistics and Biostatistics, focusing on applying univariate and multivariate calculus, linear algebra, strategies of proof, and real analysis to statistical theory and methods.

## Course learning outcomes

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

- Demonstrate understanding of convergence of sequences for application in probability and statistical theory.
- Demonstrate understanding of Riemann-Stieltjes integration for application in probability and statistical theory.
- Demonstrate understanding of matrix algebra and matrix decompositions applied in statistical and biostatistical contexts.

## Course materials

### Required

- J.E. Gentle. *Matrix Algebra: Theory, Computations, and Applications in Statistics*. Springer, 2007. Available online through OSU library: <https://ebooks.ohiolink.edu/content/fl8d4bcc-c05c-11ea-b48a-0a28bb48d135> [**G in schedule**]
- D.W. Cunningham. *Real Analysis with Proof Strategies*. CRC Press, 2021. Available online through OSU library: <https://www-taylorfrancis-com.proxy.lib.ohio-state.edu/books/mono/10.1201/9781003091363/real-analysis-daniel-cunningham> [**C in schedule**]

## 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](mailto:8help@osu.edu)
- **TDD:** 614-688-8743

## Course delivery

Lectures will be delivered live in person. Office hours are in person, but appointments can be made to meet via Zoom.

# Grading and faculty response

## Homework and exams

Assignment or category	Percentage
Participation	10
Quizzes	70
Final Exam	20
<b>Total</b>	<b>100</b>

Grades will be recorded on the class website.

**Homework:** I will not assign and collect homework for grading purposes. The textbooks listed above contain a collection of practice problems. Students are encouraged to attempt many of these problems in preparation for in-class assessments and exams. A list of suggested practice problems will be available on Carmen.

**In-class participation:** Students are expected to attend each class and participate in the discussion (ask and answer questions, share opinions, etc.).

**Quizzes:** 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 are listed on the schedule listed on the last page.

**Final Exam:** The Final Exam on **Tuesday, April 29<sup>th</sup> at 12:00-1:45pm** is comprehensive. More information will be communicated well in advance during class and through the course website.

## 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 quizzes, you can generally expect feedback within **7-10 days**.

## E-mail

I will reply to e-mails within **48 hours on school days**.

# Other course policies

## 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/>.

## Religious accommodation

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 ([equity@osu.edu](mailto:equity@osu.edu)). (Policy: [Religious Holidays, Holy Days and Observances](#))

## 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](mailto:titleix@osu.edu).

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

## 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. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.

## Accessibility of course technology

This 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](#).

## Course schedule (tentative)

Week	Dates	Topics	Reading	Assignments
1	Jan 6, 8, 10	Continuity Continued, Differentiation	C 4.5, 5.1.1	HW 1 due
2	Jan 13, 15, 17	Differentiation, The Mean Value Theorem	C 5.1.2, 5.2.1	Quiz 1
3	Jan 22, 24	The Mean Value Theorem	C 5.2.2, 5.2.3	HW 2 due
4	Jan 27, 29, 31	Riemann-Stieltjes Integration	C 6.1, 6.2	HW 3 due, Quiz 2
5	Feb 3, 5, 7	Families of Integrable Functions	C 6.3	
6	Feb 10, 12, 14	Infinite Series	C 7.1-7.2, 8.1	HW 4 due, Quiz 3
7	Feb 17, 19, 21	Sequences and Series of Functions	C 8.2-8.4	HW 5 due
8	Feb 24, 26, 28	Return to Matrix Algebra	G 3.1-3.2	Quiz 4
9	Mar 3, 5, 7	Rank and Inverse	G 3.3	HW 6 due
10	Mar 17, 19, 21	Linear Systems of Equations, Generalized Inverse	G 3.5-3.6	HW 7 due, Quiz 5
11	Mar 24, 26, 28	Eigenanalysis	G 3.8.1-3.8.4	HW 8 due
12	Mar 31, Apr 2, 4	Spectral and Other Decompositions	G 3.8.5, 3.8.10-3.8.11, 3.8.13	HW 9 due, Quiz 6
13	Apr 7, 9, 11	Data Matrices, Symmetric Matrices	G 8.1-8.2	HW 10 due
14	Apr 14, 16, 18	Definite, Idempotent, Projection Matrices	G 8.3-8.5	Quiz 7
15	Apr 21	Catch-Up		