Syllabus

STAT 6302

Theory of Statistical Analysis

Spring 2026

Credit Hours: 3

Course times and location: Monday, Wednesday, Friday, 11:30 am – 12:25 pm, Baker Systems 184

Mode of delivery: in person

Course overview

Instructor

- **Name**: Sally Paganin
- **Email Address**: paganin.1@osu.edu
- **Office location**: 229 Cockins Hall
- **Office Hours:** Wednesdays 3:00 pm – 4:00 pm or by appointment

Note: My preferred method of contact is e-mail

Graduate Teaching Assistant

Name: Guangyu Li
Email Address: Li.14071@buckeyemail.osu.edu

Course description

This course covers the topics of estimation, hypothesis testing, best tests, likelihood ratio tests, confidence sets, sufficiency, efficient estimators, and is intended primarily for students in the MAS degree program.

Course expected learning outcomes

The course outcomes include in-depth understanding of the following topics:

1. Method of moments estimators and their properties
2. Maximum likelihood estimators and their properties
3. Efficient estimators; Cramer-Rao Lower Bound
4. Sufficient statistics; exponential families
5. Confidence sets, including approximate and bootstrap confidence intervals
6. Principles of hypothesis testing; duality of confidence intervals and tests
7. Most Powerful and Uniformly Most Powerful Tests
8. Generalized Likelihood Ratio Tests; examples in applied statistics
9. Theory of statistical inferences for comparing two samples
10. Additional discretionary topics, such as theory for contingency tables

Prerequisites

Stat 6301 or Stat 610 or Stat 6801 or Stat 620 or permission of the instructor. This course assumes you are familiar with the contents of Chapter 1–7 in the John Rice textbook.

Course delivery

Partial notes will be posted on Carmen on the day before each class. These consist of a notes containing blank spaces, which I will fill in during the lecture. I will not share the marked-up slides, so please make arrangements with your classmates to obtain any missed class material.

Please make sure that you understand and can do all the examples that we cover in class.

Credit hours and work expectations

This is a **3-credit-hour course**. According to Ohio State policy (go.osu.edu/credithours), students should expect around 9 hours of engagement with the class each week to receive a grade of (C) average. Actual hours spent will vary by student learning habits and the assignments each week.

Course materials and technologies

Textbooks

Required

1. John A. Rice. Mathematical Statistics and Data Analysis (Third Edition). Duxbury, 2007.

Recommended (optional)

I will highlight useful references during the course

- Robert V. Hogg, Joseph W. McKean, and Allen T. Craig. *Introduction to Mathematical Statistics* (Seventh Edition). Pearson, 2013.
- Larry Wasserman. *All of Statistics* (First Edition). Springer, 2004.

Course technology

Required Equipment

- **Computer**: A current Mac (macOS) or PC (Windows or Linux) with a high-speed internet connection.
- **Other**: a mobile device (smartphone or tablet) to use for BuckeyePass authentication. Camera and/or scanner or tablet functionality: ability to scan, photograph, or write directly on a tablet and upload documents to Carmen

Required software

R (The R Project for Statistical Computing):

- This course requires the use of the statistical software **R**, which is free and open-source.
- Please install the **latest stable version of R** available at the time you set up your system.
- R is available for Windows, macOS, and Linux from the **Comprehensive R Archive Network (CRAN)**.
- An in-depth introduction to R is available through the **R Introduction Manual**.

RStudio (optional, recommended):

RStudio is an easy-to-use interface for working with R. It is available for Windows, macOS, and Linux and can be downloaded for free from **Posit**.

Note: R must be installed before installing RStudio.

Grading and instructor response

How your grade is calculated

Assignment Category		Percentage
Homework	Almost weekly, due Friday at 11.30am	20%
Midterm 1	Fri, February 27 2026 (in class)	20%
Midterm 2	Mon, March 30 2026 (in class)	20%
Final Exam	Fri, May 1 2026 12:00pm-1:45pm	40%
Total		**100%**

Description of major course assignments

Homework

- **Description**

  Homework assignments are **due on Fridays** at 11.30 am (before the beginning of the class) and must be submitted **online via Carmen/Gradescope**.

  You are **required to handwrite your solutions** and submit them as a scanned PDF. Only a portion of each homework assignment will be graded; however, **all problems may be relevant for exams**.

- **Academic integrity and collaboration guidelines**

You are encouraged to work collaboratively on homework assignments; however, **you must not copy any part of another student's work**

You **may use generative AI tools** (e.g., Gemini, ChatGPT, etc.) to help you understand concepts or clarify questions. However, **you may not copy and paste code, solutions, or written text** from the internet or from any AI tool into your submission.

If you collaborate with others and/or use generative AI tools, you **must include a disclosure statement at the beginning of your submission** specifying i) with whom you collaborated, and ii) which generative AI tools you used, and how you used them.

Exams

○ Description

There will be **two midterm exams** and **one final exam.** Exams will cover materials up to the exam date unless otherwise specified. Exam 2 will emphasize the contents since Exam 1. Although it will emphasize content since Exam 2, the Final Exam is comprehensive and may test material from the entire course.

If an exceptional circumstance arises (e.g., a medical or family emergency), please contact the instructor as soon as possible **before the exam date** to discuss possible arrangements.

○ Academic integrity and collaboration guidelines

You may **not collaborate with anyone or an AI entity** on exams. You may **not access or view previous exams or solutions**, except for practice materials explicitly provided by the instructor.

Exams are **closed book and closed notes**. **No electronic devices** are permitted. A **handwritten cheat sheet** may be permitted only if explicitly announced in advance, along with clear guidelines on its content.

You may **not discuss or share any exam content** with others until **all students have completed the exam**, including those who have not yet taken it.

Late assignments

No late assignments will be accepted without prior permission or appropriate documentation. The lowest homework grade will be dropped for each student. Accommodations can be made in case of emergency, so please notify me as soon as possible if this situation arise.

Grading Scale

- 93-100: A
- 90-92: A–
- 87-89: B+
- 83-86: B
- 80-82: B–
- 77-79: C+
- 73-76: C
- 70-72: C–
- 67-69: D+
- 60-66: D
- Under 60: E

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) at any time if you have a technical problem.

Grading and feedback

For homework assignments, you can generally expect feedback and grades within **a week.**

Preferred contact method

If you have a question, please contact me first through my Ohio State email address. I will reply to emails within **48 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 (go.osu.edu/canvas-notifications) to ensure you receive these messages.

Academic policies

This course follows all required Ohio State University syllabus policies, including Academic Misconduct, Disability Services, Religious Accommodations, and Intellectual Diversity. Full statements are available at: https://ugeducation.osu.edu/academics/syllabus-policies-statements

Course Schedule

Refer to our Carmen course page for up-to-date assignment due dates.

Week	Date(s)	Topics / Activities	Homework / Exams
1	Jan 12–16	Introduction; review of probability models and random samples; intro to estimation	
	Jan 19	**No class (MLK day)**	
2	Jan 21–23	Estimating parameters of a probability model: method of moments	HMW 1
3	Jan 26–30	Estimating parameters of a probability model: maximum likelihood estimation (MLE)	HMW 2

Week	Date(s)	Topics / Activities	Homework / Exams
4	Feb 2–6	MLE; Cramér–Rao inequality; efficiency	HMW 3
5	Feb 9–13	Sufficiency; Rao–Blackwell theorem	HMW 4
6	Feb 16–20	Exponential family; Confidence intervals.	HMW 5
7	Feb 23–25	Confidence intervals; Review.	
	Feb 27	**Midterm exam 1**	
8	Mar 2–6	Confidence intervals; CLT; approximate intervals	
9	Mar 9–13	Hypothesis testing	HMW 6

Week	Date(s)	Topics / Activities	Homework / Exams
10	Mar 16–20	**No class (Spring Break)**	
11	Mar 23–27	Uniformly most powerful tests; Review.	
	Mar 30	**Midterm exam 2**	
12	Apr 1 –Apr 3	Likelihood ratio tests	HMW 7
13	Apr 6–10	Likelihood ratio tests (continued)	
14	Apr 13–17	Goodness-of-fit tests	HMW 8
15	Apr 20–23	Additional topics; review and further directions	

Week	Date(s)	Topics / Activities	Homework / Exams
Finals	April 30	Final Exam (12:00–1:45 pm)	Final Exam