



STAT 4301

Advanced Statistical Inference (25211)

Autumn 2026

Syllabus - Instructor Information

Oh-Ran Kwon

Professional Qualifications

Ph.D. in Statistics, University of Minnesota

M.S. in Statistics, Seoul National University

B.E. in Statistics, Sungkyunkwan University

Syllabus - Required or Recommended Readings

Morris H. DeGroot and Mark J. Schervish, *Probability and Statistics*, Pearson, ISBN: 978-0321500465.

Syllabus - Course Schedule

Week	Topics
1	Review of probability
2	Review of probability (continued), Random Variables, Discrete probability distributions
3	Discrete probability distributions (continued), Continuous probability distributions
4	Bivariate distributions, Conditional and marginal distributions
5	Functions of random variables

Week	Topics
6	Functions of random variables (continued), Expectation and moments
7	Special distributions – Binomial, Poisson, Hypergeometric, Normal, Gamma, Beta, etc.
8	Law of large numbers, Central limit theorem
9	Estimation: method of moments and maximum likelihood estimators
10	Estimation: method of moments and maximum likelihood estimators (continued), Sufficient statistics
11	Sufficient Statistics (continued), Bayes estimators
12	Sampling distribution of estimators, Confidence intervals
13	Confidence intervals (continued), Unbiased estimators, Fisher information
14	Fisher information (continued)
15	Hypothesis testing
16	Hypothesis testing

Course Details - Instructor Contact Details

Email: kwon.675@osu.edu (Please include the course title STAT 4301 in the title of your email.)

Course Details - Office Hours

Office Hours: Mondays, 10:15 AM–11:15 AM, Cockins Hall 340D, or by appointment.

Please use the following calendar to sign up for Monday office hours: <https://calendly.com/ohrankwon/office-hours>. For appointments outside the scheduled office hours, please contact me by email, preferably at the beginning of the week.

Course Details - Additional Instructional Staff

Teaching Assistant: Jongha Lee (Lee.10895@buckeyemail.osu.edu)

Tutoring and office hours will be coordinated through the Data Analytics Learning Center (DALC) (<https://data-analytics.osu.edu/dalc>) and Mathematics and Statistics Learning Center (MSLC) (<https://mslc.osu.edu/>). More details on hours for this course coming soon.

Course Details - Class Meeting Details

Class Meeting Details: 09:10 AM-10:05 AM - Pomerene Hall 250 - MWF

Course Details - Course Description

Advanced probability models and fundamentals of inferential procedures; distribution functions, moment generating functions, transformations, order statistics, large-sample theory, classical hypothesis testing, distribution-free hypothesis tests. Prereq: 3201 and 3202, or 4201 and 4202; and Math 2153; or permission of instructor.

Prerequisite(s) / Corequisites: Prereq: 3201 and 3202, or 4201 and 4202; and Math 2153; or permission of instructor.

Course Details - More About This Course

Course Overview: This course will introduce advanced theory and methods at the undergraduate level for statistical inference. This course is primarily intended for senior Statistics majors. The course will cover probability theory, statistical models and distributions, methods for estimation and hypothesis testing. We will discuss mathematical theory behind these approaches and provide examples showing applications of these methods.

Lecture Notes: I will also post incomplete lecture notes on Carmen before each class, which will be interactively completed in class through annotation. You are

strongly encouraged to regularly attend class to understand the material and be prepared for homework assignments.

Course Details - Course Learning Outcomes

Upon successful completion of the course, students will be able to

1. Quantify uncertainty about events using mathematical descriptions of probability.
2. Understand important concepts in mathematical statistics.
3. Learn statistical methods for estimation and inference and understand the mathematical theory underlying them.

Course Details - Detailed Course Schedule

Course Schedule (Tentative)

Week	Dates	Topics
1	Aug 26, 28	Review of probability
2	Aug 31, Sep 2, 4	Review of probability (continued), Random variables, Discrete probability distributions
3	Sep 9, 11	Discrete probability distributions (continued), Continuous probability distributions
4	Sep 14, 16, 18	Bivariate distributions, Conditional and marginal distributions
5	Sep 21, 23, 25	Functions of random variables
6	Sep 28, 30, Oct 2	Functions of random variables (continued), Expectation and moments, Midterm Exam 1 (Oct 2)
7	Oct 5, 7, 9	Special distributions – Binomial, Poisson, Hypergeometric, Normal, Gamma, Beta, etc.
8	Oct 12, 14	Law of large numbers, Central limit theorem

Week	Dates	Topics
9	Oct 19, 21, 23	Estimation: method of moments and maximum likelihood estimators
10	Oct 26, 28, 30	Estimation: method of moments and maximum likelihood estimators (continued), Sufficient statistics, Midterm Exam 2 (Oct 30)
11	Nov 2, 4, 6	Sufficient statistics (continued), Bayes estimators
12	Nov 9, 13	Sampling distribution of estimators, Confidence intervals
13	Nov 16, 18, 20	Confidence intervals (continued), Unbiased estimators, Fisher information
14	Nov 23	Fisher information (continued)
15	Nov 30, Dec 2, 4	Hypothesis testing
16	Dec 7, 9	Hypothesis testing, Final exam review

Dates for exams:

- **Midterm Exam 1: Friday, October 2, 2026, during class time.**
- **Midterm Exam 2: Friday, October 30, 2026, during class time.**
- **Final Exam (University scheduled): Monday, Dec 14, 2026, between 10:00-11:45 AM.**

Course Details - Grading Policy

Component	Percentage
Homework	30%
Midterm Exams 1 and 2	40%
Final Exam	30%
Total	100%

Homework: Homework will be assigned regularly (approximately 5 assignments over the course of the semester). It will consist of written problems. Homework assignments must be **combined into a single PDF file and submitted through Carmen by the due date. All homework assignments will be graded based on completeness rather than correctness of the solutions. Solving homework problems provides important practice of the material that is covered in this course.** You are encouraged to work together on the problems, but each student must submit their own work, written in their own words. Do not copy any part of another student's homework. Use of homework solutions distributed in previous offerings of the course or available on the web constitutes academic misconduct and will be handled according to university rules. Please make sure your solutions are clearly written, complete and legible. I encourage you to talk to me during office hours if you have questions after serious attempts have been made to work on an assignment. **Please note late submission will be penalized at a rate of 5% of the points earned on the assignment per day late. The late penalty may be waived if prior approval has been obtained.**

Exams: There will be **two in-class midterm exams and a final exam.** Coverage includes lecture material, assigned reading, and homework. **All exams are in-person and closed book/closed notes.** The in-class midterm exams will take place at the usual lecture room during regular class hours. The final exam location and time are university scheduled. Further details will be given in advance of each exam. Statistical tables will be provided as needed. Calculators may be used, but no communication devices are allowed (e.g. mobile phones). You may use one 8.5x11 inch handwritten sheet of paper (both sides) with formulas. **Make-up exams will generally not be provided. If there are extenuating circumstances beyond your control, please contact the course instructor immediately. Appropriate documentation is required.**

Course Details - Grading Scale

Letter Grade	Percentage Range
A	100% to 93%
A-	< 93% to 90%
B+	< 90% to 87%

Letter Grade	Percentage Range
B	< 87% to 83%
B-	< 83% to 80%
C+	< 80% to 77%
C	< 77% to 73%
C-	< 73% to 70%
D+	< 70% to 67%
D	< 67% to 60%
E	< 60% to 0%

Course Details - Other

Course Delivery

The course will be primarily delivered in person. Some lectures may be presented online, either live over Zoom during the scheduled lecture time or as recorded lectures posted on the class website in Carmen.

Each week we will cover approximately 165 minutes of content in total. Students are responsible for attending in-person lectures and studying assigned material. Assignments will be posted in Carmen.

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
- TDD: 614-688-8743

Baseline technical skills necessary for this course

- Basic computer and web-browsing skills
- Navigating Carmen

Technology skills necessary for this specific course

- Zoom
- Scanning a written solution and submitting a PDF file through Carmen.

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 10+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in laptop or tablet mic or external microphone

Necessary software

- While this class is primarily theoretical, occasionally we may use the statistical software package called R to illustrate certain methods or theories through simulation (The R Project for Statistical Computing; <http://www.r-project.org/>). This software package is available as free software.
 1. You can download R for Windows, Mac, and Linux, from the CRAN archive at <https://cran.r-project.org>.
 2. An in-depth introduction to R is available at <http://cran.r-project.org/doc/manuals/R-intro.pdf>
 3. Hands-on tutorials are available in the Swirl system, which you can learn about at <http://swirlstats.com/>. In particular, “R Programming: The basics of programming in R” is an appropriate first tutorial for students who have never used R.
- An easier-to-use interface to R is available in the software package 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.
- [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.

1. 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.
2. Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found <https://ocio.osu.edu/kb04733>.

Course Details - Instructor Policies

Faculty Feedback and Response Time

I am providing the following list to give you an idea of my intended availability throughout the course.

- **Grading and feedback:** You can generally expect graded homework assignments back within **14 days**.
- **E-mail:** Please include the course title STAT 4301 in the subject line of your email. I will reply to emails related to course logistics within **72 hours on school days**. However, if you have questions about course material or homework assignments, please visit my office hours or the shared tutoring hours at MSLC or DALC.

Course Details - Course Policies

Student Participation Requirements

The following is a summary of everyone's expected participation:

- **Logging in: AT LEAST ONCE PER WEEK**
Be sure you are logging in to the course in Carmen each week, including weeks with holidays. If you have a situation that might cause you to miss

an entire week of class, discuss it with me as soon as possible.

- **In-person lectures: REGULAR ATTENDANCE EXPECTED**

Students are expected to attend in-person lectures regularly and are responsible for all material presented during these lectures. Students are also expected to participate, discuss, and answer questions in lectures.

- **Office hours: OPTIONAL**

All office hours are optional and will be held in person in my office.

Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Tone and civility:** Let us maintain a supportive learning community where everyone feels safe and where people can disagree amicably.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say.

Academic Integrity Policies

- **Exams:** You must complete the exams yourself, without any external help or communication.
- **Written assignments:** Your written assignments should be your own original work. You are allowed to discuss problems with your peers and work together, but each submission must be written in your own words.
- **Reusing past work:** In general, you are prohibited from turning in work from a past class to your current class, even if you modify it. If you would like to build on previous work, please discuss the situation with me.

Disclaimer

This syllabus should be taken as a fairly reliable guide for the course content. However, due dates, course topics, or methods of grading and assessment may be changed if necessary. Any changes will be communicated through official course announcements.

Course Details - AI Use Policy

GenAI can fabricate information or provide incorrect mathematical or statistical reasoning. You are ultimately responsible for the accuracy and integrity of your submitted work. Unless explicitly permitted, representing AI-generated content as your own work is a violation of the [Code of Student Conduct](#). Please check with the instructor if you have questions.

Permitted: You may use GenAI as a study aid or virtual tutor—for example, to explain general course concepts, quiz you on course topics, or help you review material you have personally created.

Prohibited: You may not use GenAI to solve, outline, draft, translate, or write any part of a homework assignment or exam submitted for credit. Submitted solutions must reflect your own reasoning and be written in your own words. Do not input or allow AI to access instructor-created course materials, including lecture notes, slides, assignments, or exams, without explicit permission.

Exams: Use of GenAI is not permitted during exams.

If I suspect that you have used GenAI inappropriately on an assignment for this course, I will ask you to communicate with me to explain your process for completing the assignment in question.

Syllabus - University Policies

Office of Undergraduate Education - Standard Syllabus Statements

- [Academic Misconduct](#)
- [Religious Accommodations](#)
- [Accommodations for Disability and Illness](#)
- [Intellectual Diversity](#)
- [Grievances and Solving Problems](#)
- [Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct](#)

- [Copyrights](#)
- [Content Warnings](#)
- [Mental Health Support](#)
- [Resources for Military-Connected Students](#)
- [Campus-wide Class Cancellations](#)