



THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 3201

INTRODUCTION TO PROBABILITY FOR DATA ANALYTICS

SPRING 2022

Course overview

Instructor

Instructor: Dr. Jennifer A. Sinnott

Email address: jsinnott@stat.osu.edu

Office hours: Virtual Hours are Mondays and Wednesdays 1:50-2:45pm, and by appointment. Link will be posted on Carmen.

Grader or Teaching Assistant

Grader: Cheng Yu Hung (hung.253@buckeyemail.osu.edu)

The grader's office hours will be posted on Carmen, as well as information about the Data Analytics Learning Center (DALC) hours this semester.

Course description

Statistics 3201 offers an introduction to probability and its role in statistical methods for data analytics. Equal emphasis is placed on analytical and simulation-based methods for quantifying uncertainty. Approaches to assessing the accuracy of simulation methods are discussed. Students should have some prior knowledge of basic programming. Applications of probability and sampling to big-data settings are also discussed.

Prerequisites: Math 1152 or 1161.xx or 1172 or 1181 or equivalent.

Course learning outcomes

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

1. Quantify uncertainty about events using mathematical descriptions of probability.

2. Quantify uncertainty about events using simulation methods.
3. Assess the quality and accuracy of simulation-based descriptions of uncertainty.
4. Update a description of uncertainty based on new information.
5. Identify appropriate probability models for experiments/data and summarize expected outcomes from such models.
6. Use correlation and conditional expectation to describe the relationship between two random variables.
7. Quantify uncertainty about summary statistics for large data sets.

Course materials

Required textbook:

Mathematical Statistics with Applications (7th edition) by Wackerly, Mendenhall and Sheaffer.

The textbook for this course is being provided via CarmenBooks. Through CarmenBooks, students obtain publisher materials electronically through Carmen/Canvas, saving them up to 80% per title. The fee for this material is included as part of tuition and is listed as *CarmenBooks fee* on your Statement of Account. In addition to cost-savings, materials provided through CarmenBooks are available immediately on or before the first day of class. There is no need to wait for financial aid or scholarship money to purchase your textbook.

Unless you choose to opt out of the program, you do NOT need to purchase any materials for this course at the bookstore. For more information on the program or information on how to opt out, [please visit the CarmenBooks website](#).

Access this eBook through the **CARMENBOOKS reader link** in the course navigation of your Carmen course for this class.

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 online courses

- Basic computer and web-browsing skills
- Navigating Carmen

Technology skills necessary for this specific course

- CarmenZoom
- Submitting an assignment (homework, exam, etc.) as a single pdf document

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

- This class requires you to use the statistical software package called R (The R Project for Statistical Computing; <http://www.r-project.org/>) to illustrate certain aspects. Here is the information for obtaining R.
 - You can download R for Windows, Mac, and Linux, from the CRAN archive at <https://cran.r-project.org>.
 - An in-depth introduction to R is available at <http://cran.r-project.org/doc/manuals/R-intro.pdf>
 - 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 <https://posit.co>. **Note that RStudio requires R to be installed.**
- It may be helpful to become familiar with the (free) R Markdown authoring framework as you take this class; its use is required in future courses in this sequence. An online guide with overview information can be found at <https://rmarkdown.rstudio.com>.
- [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.
 - 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.
 - Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found <https://ocio.osu.edu/kb04733>.

Course delivery

There will be weekly **asynchronous lectures**. The scheduled meeting times will be used for **office hours** on **Mondays** and **Wednesdays**, and a **synchronous session every Friday**.

Attendance is expected for the Friday synchronous sessions. These synchronous sessions will consist of working through examples, going through R code, and working in groups on group lab assignments.

Each week **by Friday night**, a collection of **asynchronous content** will be posted. Students are expected to work through and complete the material by the end of the following week. The asynchronous material will include:

- **Reading assignments** from the textbook.
- **Videos** representing the equivalent of three 55-minute lectures that provide in-depth discussion of the topics for the week.
- **Quizzes** on the reading and lecture material, to help you apply and retain the material.
- Most weeks, a **homework assignment**, to help assess your understanding of the material, will be posted as well.
- Some weeks, a **group lab assignment** to help you learn to program in R will be posted. There will be a Friday synchronous session in which you can meet with your group members. You will submit a single submission per group.

IMPORTANT: I will communicate with you through **Carmen email** or **Carmen Announcements**, so please make sure that you are notified when you receive emails or when announcements are posted.

Grading and faculty response

Grades

Assignment or category	Percentage
Homework	15
Group Lab Assignments	15
Quizzes	10
Midterm 1	15
Midterm 2	20
Final Exam	25
Total	100

Assignment information

Homework: The goal of homework assignments is to help you learn the material. There will be homework assignments posted on the course website, and they will be typically due once per week, with dates and times provided. They will consist of mostly textbook-style problems and problems motivated by data analytics applications. Homework may be typed or handwritten and scanned; if handwritten, the student is responsible for verifying that the writing is clear and legible and the scanned version is of good quality (e.g., not blurry). **Scans should be compiled into a single pdf and submitted.** Any R code and output must be typed. Please be sure that the questions are clearly labeled, all supporting work (including computer code) can be easily identified, and that all figures/tables are referenced and interpreted in the text.

Academic Integrity and Collaboration for Homework: You are encouraged to work with other Stat 3201 students on homework and you may consult references both internal and external to the course material. **Each student must produce their own assignment to be handed in. Do not copy any part of another student's homework. You must list at the top of your homework your collaborators and any references (texts or other online materials) that you consulted. 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.**

Quizzes: The goal of the quizzes is to keep you motivated to read the textbook and keep up with the asynchronous content. There will typically be quiz questions assigned weekly. These will be administered online, through Carmen. There will be no time restrictions on completing the quizzes, and you will have multiple attempts.

Academic Integrity and Collaboration for Quizzes: The rules are the same as for homework -- you may consult references both internal and external to the course and you may work with other Stat 3201 students. For quizzes, you do not need to list collaborators / sources, since I'm not sure how you would. I strongly encourage you to attempt these quizzes on your own for the first time, to help you evaluate your understanding and learning. You are allowed multiple attempts at the quizzes for just this reason: to encourage you to try them on your own without penalty to your grade.

Group Lab Assignments: The goal of group lab assignments is to help you learn how to program in R and to use programming to solidify concepts from class. I will include sample code in my notes and post sample code to Carmen, but the best way to learn to code in R is to practice. Working with other students while learning to code is helpful, because when errors arise it's nice to have other people help inspect your code! R code and output must be typed. Please be sure that the questions are clearly labeled, all supporting work (including computer code) can be easily identified, and that all figures/tables are referenced and interpreted in the text.

Academic Integrity and Collaboration for Group Lab Assignments: Each group submits a single assignment, but each student in the group is expected to understand the submitted work. It is also fine to work with other Stat 3201 students (i.e., those not in your group) and consult references both internal and external to the course material. **Use of solutions distributed in previous offerings of the course or available on the web constitutes academic misconduct and will be handled according to university rules.**

Exams: The goal of the exams is both to help you solidify your understanding of the material and to evaluate you on your knowledge. There will be two midterm exams and one final exam. All exams will be delivered remotely, via Carmen. The exam will be available for a time window (e.g., 6 hours) that includes the scheduled class time, and you will choose a time during that window to take the exam. When you open the exam, you will have a specified length of time to complete the exam (e.g., 1 hour). Statistical tables will be provided as needed. Calculators may be used. You will not be expected to do R coding during the exam, but if appropriate some R code and output may be displayed for interpretation.

Academic Integrity and Collaboration for Exams: For exams, you may consult your course text and lecture materials, but **you may not consult other students in Stat 3201 OR materials, people, or online forums outside of Stat 3201. Exams should be completed without any external help or communication.**

Late assignments

Generally late assignments are not accepted. If you are unable to complete an assignment on time, please get in touch with me *as soon as possible* so we can discuss your situation.

Grading scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70–72.9: C-
67–69.9: D+
60–66.9: D
Below 60: E

Faculty feedback and response time

Remember that you can call **614-688-HELP** at any time if you have a technical problem.

Grading and feedback

For weekly assignments, you can generally expect feedback within **7 days**.

E-mail

I will typically reply to e-mails within **48 hours on school days**. If you do not get a response within that timeframe, feel free to email again.

Attendance, participation, and discussions

Student participation requirements

Because this is a distance-education course, your attendance is based on your online activity and participation. The following is a summary of everyone's expected participation:

- **Friday Synchronous sessions: ATTENDANCE IS EXPECTED**

It is fine if you need to miss a session here or there, but in general you are expected to attend the Friday synchronous sessions. If you cannot make a session which involves group work, you will generally be expected to submit the group assignment on your own.

- **Checking for course emails and announcements: DAILY**

Important announcements will be sent through Carmen (using Announcements or email) so please make sure that you see those regularly -- e.g., that you check emails that are sent through Carmen and that you receive notification of announcements. You can look at your Settings in Carmen to verify that you receive appropriate notifications.

- **Logging in: AT LEAST TWICE PER WEEK**
Be sure you are logging in to the course in Carmen each week, including weeks with holidays or weeks with minimal online course activity. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Office hours: OPTIONAL, BUT STRONGLY ENCOURAGED**
Attending my office hours is optional, but is a good way to stay connected to the course and ask questions.

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's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)

Course schedule (tentative)

Week	Dates	Topics, Major Deadlines
1	Jan 9, 11, 13	Orientation and course introduction; descriptive statistics
2	Jan 18, 20	Introduction to probability, Calculating Probabilities
3	Jan 23, 25, 27	Tools for Calculating Probabilities
4	Jan 30, Feb 1, 3	Probability Laws and Bayes' Theorem
5	Feb 6, 8, 10	Discrete random variables; expected value and variance
6	Feb 13, 15, 17	Named discrete distributions
7	Feb 20, 22, 24	Named discrete distributions; Midterm 1 Feb 24
8	Feb 27, Mar 1, 3	Continuous random variables
9	Mar 6, 8, 10	Named continuous distributions
10	Mar 20, 22, 24	Named continuous distributions
11	Mar 27, 29, 31	Functions of random variables
12	Apr 3, 5, 7	Sampling distributions, central limit theorem; Midterm 2 Apr 7
13	Apr 10, 12, 14	Bivariate distributions; Marginal and conditional distributions
14	Apr 17, 19, 21	Conditional expected values; covariance and correlation
15	Apr 24	Bivariate Normal distribution
FINAL	May 2	Final Exam

Academic integrity policy

Academic integrity is a shared responsibility. We want to have a supportive and fair learning environment for all students. If you find yourself struggling with the course material as the semester proceeds, reach out to me or to the other teaching staff for extra assistance. Attend office hours. If you are struggling on homework assignments or quizzes, reach out to me or to other students for help. Violations of academic integrity standards on the part of even a single student can have negative repercussions for all students. For example, if we detect evidence of cheating on exams, not only will the procedures for investigation of academic misconduct be pursued for any involved students, but it may also result in more stringent administration of subsequent exams. **Please help us to maintain a positive and fair learning environment for all students by adhering to these policies for academic integrity.**

Policies specific to Homework, quizzes, and exams are detailed in the **Assignment Information** section.

Ohio State's 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/>.

Other course policies

Health and safety

The Ohio State University Wexner Medical Center's Coronavirus Outbreak site (<https://wexnermedical.osu.edu/features/coronavirus>) includes the latest information about COVID-19 as well as guidance for students, faculty and staff.

I expect that you will read and follow the guidelines and requirements for campus safety, which are available at <https://safeandhealthy.osu.edu>.

If you are unable to attend or participate in class for an extended period of time due to illness or quarantine, please let me know as soon as possible and we will make arrangements.

Student academic services

Student academic services offered on the OSU main campus
<http://advising.osu.edu/welcome.shtml>.

Student support services

Student support services offered on the OSU main campus <http://ssc.osu.edu>.

Copyright disclaimer

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.

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

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; <http://slds.osu.edu>; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This online 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](#)
- Streaming audio and video
- Synchronous course tools

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. 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 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 National Suicide Prevention Hotline at 1-800-273- TALK or at [suicidepreventionlifeline.org](https://www.suicidepreventionlifeline.org)

Disclaimer

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.