SYLLABUS: STAT 3201
INTRODUCTION TO PROBABILITY FOR DATA ANALYTICS
SPRING 2024

Course overview

Instructor

Instructor: Dr. O. Ozturk
Email address: Ozturk.4@osu.edu
Office hours: TR, 1:00—2:00pm. Cockins Hall, 419.

Grader or Teaching Assistant

Grader: Zehao Yan (Yan.1547@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.
For all homework grading questions, contact the grader first. If cannot reach agreement, escalate the case to me.

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

- Submitting all homework assignments as pdf documents

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

The course will be in-person. When I am on (occasional) academic travel, I will post video lectures for those classes in advance.

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

Grade breakdown

Assignment or category	Percentage
Homework	15
Lab	10
Midterm 1 (Feb. 23)	25
Midterm 2 (Apr. 5)	25
Final Exam (Apr. 25)	25

Homework and exams

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.** 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.

All homework assignments must be submitted online through Carmen. Do not submit in printed or handwritten copy. Except for special reasons (sick, accident, or other irresistible urgency), no late homework is accepted.

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 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.**

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. The all exams will be in-person. More details will be posted when it comes close to the exam dates.

In-person exams: closed book, you are allowed a calculator (of any make, must be "just a calculator"), and A4/letter-size, double-sided cheat sheet of your own making (one piece allowed for Exam 1; two pieces for Exam 2; three pieces for final exam).

R programming

This course includes some contents on R. Indeed, R is a very important tool for data analysis. However, I do not put R as a rigid requirement. In homework assignments, all R programming questions are not required, but you are strongly encouraged to complete them and compare to solutions on your own. You are also encouraged to use R as an assistance for answering other homework questions. R programming is not part of any exam in this course. You cannot use electronic devices in exams, thus also cannot use R to assist the solution to any exam question.

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

Tech support and email repliess

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

Emails

I will typically reply to student emails weekly. Please feel free to contact again if you don't receive a reply within a week.

Attendance

Student participation requirements

I do not check your attendance for grading purposes. There is no such thing as an attendance record in this course that directly translates to part of your course grade. You also do not need to request the permission of absence from me in advance should you need to miss a class.

On the other hand, however, you are also responsible of making up any missed class contents due to absence on your own and keep up with the pace of the course. I will not reteach the content of the classes you missed during, say, office hours.

An obvious exception to this "freedom of attendance/absence" policy is exam. If you cannot attend an exam, you must request an excused absence in advance and as early as possible.

Course schedule (tentative)

Week	Dates	Topics, Major Deadlines
1	Jan 8, 10, 12	Orientation and course introduction; descriptive statistics
2	Jan 17, 19	Introduction to probability, Calculating Probabilities
3	Jan 22, 24, 26	Tools for Calculating Probabilities
4	Jan 29,31, Feb 2	Probability Laws and Bayes' Theorem
5	Feb 5, 7, 9	Discrete random variables; expected value and variance
6	Feb 12, 14, 16	Named discrete distributions
7	Feb 19, 21, 23	Named discrete distributions; **Midterm 1 Feb 23**
8	Feb 26, 28, Mar 1	Continuous random variables
9	Mar 4, 6, 8	Named continuous distributions
10	Mar 18, 20, 22	Named continuous distributions

Week	Dates	Topics, Major Deadlines
11	Mar 25, 27, 29	Functions of random variables
12	Apr 1, 3, 5	Sampling distributions, central limit theorem; **Midterm 2 Apr 5**
13	Apr 8, 10, 12	Bivariate distributions; Marginal and conditional distributions
14	Apr 15, 17, 19	Conditional expected values; covariance and correlation
15	Apr 22	Bivariate Normal distribution
FINAL	Apr 25	**Final Exam**

See schedule spreadsheet on Carmen (separate file).

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.

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