THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 3201
INTRO TO PROBABILITY FOR DATA ANALYTICS
AUTUMN 2025

Course overview

Instructor

Instructor:	Dena Asta
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Grader:	Skylar Shi
Email address:	shi.2154@osu.edu

Class Website:	Carmen
Lectures:	MWF at 11:30-12:25pm in Cockins Hall 240
Office hours:	TW 10:00-11:00am and by appointment (please schedule appointments at least 24 hours in advance). Office in Cockins Hall 427.

Course description

STAT 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 discussed.

Course learning outcomes

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

- Quantify uncertainty about events using mathematical descriptions of probability
- Quantify uncertainty about events using simulation methods
- Assess the quality and accuracy of simulation-based descriptions of uncertainty
- Update a description of uncertainty based on new information

- Identify appropriate probability models for experiments/data and summarize expected outcomes from such models
- Use correlation and conditional expectation to describe the relationship between two random variables.
- Quantify uncertainty about summary statistics for large data sets

Course materials

Required textbook:

Mathematical Statistics with Applications, seventh edition) by Wackerly, Mendenhall and Sheaffer; available through the CARMENBOOKS reader link in the course navigation of your Carmen course for this class.

Supplemental textbook:

Introduction to Probability and Statistics using R by Kerns; available online at https://cran.r-project.org/web/packages/IPSUR/vignettes/IPSUR.pdf

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, Quizzes and Exams

Assignment or category	Percentage
Homework	**15**
Midterm 1	**25**
Midterm 2	**25**
Project	**10**
Final Exam	**25**
Total	**100**

The lowest homework grade will be dropped at the end of the semester. The following rubric will be used to compute the final letter grade: A: 93 – 100, A-: 90 – 92.9, B+: 87– 89.9: B: 83 –

86.9, B-: 80-82.9, C+: 77-79.9, C: 73 – 76.9, C-: 70–72.9, D+: 67 – 69.9, D: 60–66.9, E: below 60. The instructor reserves the right to make appropriate changes to the above if necessary. However, as usual there are no exceptions nor arbitrary grade adjustments for individual students, nor grade guarantees of any kind, for any reason.

Homework: Homework will be assigned approximately biweekly. It will consist of mostly textbook-style problems, problems motivated by data analytics applications, and small computer simulation problems. Question numbers referenced in the homework are from the textbook edition listed above. If you are using a different edition/version of the textbook, it is your responsibility to check that you have solved the correct questions. No points will be awarded for answering a question other than the one being assigned. You are encouraged to work together on the problems, but each student must hand in his or her own work, written in his or her own words. Do not copy any part of another student's homework including computer code or output. 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. Sharing or disseminating solutions, or in any way knowingly enabling others to commit academic misconduct also constitutes academic misconduct and will be reported. Homework solutions should be submitted online via Carmen before class on the due date. The solutions may be handwritten or typed, except any R code and output, which must always 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.

Exams: There will be three in-class exams. Coverage includes lecture material, assigned reading, and home- work. Tentative dates are provided on the weekly lesson plan. 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 8.5×11-inch handwritten sheet of paper (both sides) with formulas for all exams. Make-up exams require a valid excuse and official proof if the instructor is not notified in advance or as soon as possible. A make-up exam must be taken within a week of the missed exam. Exceptions to this policy are permitted only in extreme situations such as serious injury immediately prior to an exam or severe illness requiring hospitalization.

Project: A class project will consist of a written report and will require use of the R software.

Computing

The class requires you to use the statistical software package R, which can be downloaded for free at http://www.r-project.org. Instructions for using R will be given in class. Many students prefer to use RStudio, an IDE designed for use with R. RStudio is available for free at http://www.rstudio.com.

Tentative Schedule of Topics

Week	Book sections	Topics
1	1.1	Orientation, course introduction, introduction to R
2	1.2-1.3	Introduction to R, characterizing data using numerical and graphical summaries Labor day Monday (no class Mon)
3	2.1-2.6	Introduction to probability and counting methods
4	2.7-2.10	Conditional probability and independence, probability laws, Bayes' Theorem
5	3.1-3.2	Discrete random variables and probability distributions
6	3.3	Expected value and variance
7	**Midterm 1** 3.4-3.8	Bernoulli, Binomial, Negative Binomial, Geometric, Hypergeometric, Poisson **Midterm 1 on Wednesday**
8	3.4-3.8	Bernoulli, Binomial, Negative Binomial, Geometric, Hypergeometric, Poisson Fall Break (no class Fri)
9	4.1-4.3	Continuous random variables and their probability distributions
10	4.4-4.7	Uniform, Normal, Gamma, Exponential, and Beta
11	6.1-6.3	Functions of random variables
12	**Midterm 2** 7.1-7.3	Sampling distributions, Central Limit Theorem **Midterm 2 on Wednesday**
13	5.1-5.2	Bivariate probability distributions Veteran's Day (no class Mon)
14	5.3-5.4, 5.11	Marginal and conditional distributions, independent random variables, Conditional expected values
15	5.7	Covariance and correlation, Thanksgiving Break (no classes Wed-Fri)
16	5.1	Bivariate Normal distribution **Final Exam on Thursday, Dec 18th at 10-11:45am**

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). (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.

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 **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; 614-292-3307; 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.