



# Syllabus: STAT 3201

Introduction to Probability for Data Analytics

SPRING 2026 ONLINE

Synchronous Online with some asynchronous components

## Course overview

### Instructor

Instructor: Subhadeep Paul

Email address: [paul.963@osu.edu](mailto:paul.963@osu.edu)

Lectures: Mondays, Wednesdays and Fridays, 8:00 AM -- 8:55 AM Online via zoom.

Office hours: Online via zoom, Wednesdays 12:00 Noon – 1:00 PM.

**The zoom links for lecture and office hours shared through carmen.**

### Teaching Assistant and Tutoring

Jaehoon Kim ([kim.9859@buckeyemail.osu.edu](mailto:kim.9859@buckeyemail.osu.edu))

Tutoring and office hours will be coordinated through 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 coming soon.



## Course description

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.

Topics we will cover:

1. Introduction to Probability
  - a. Introduction to probability and counting methods
  - b. Conditional probability, independence, Bayes' Theorem
  - c. Discrete random variables and probability distributions
  - d. Simulation and Monte Carlo estimation
2. Discrete probability distributions
  - a. Bernoulli and Binomial
  - b. Negative Binomial, Geometric, Hypergeometric, and Poisson
3. Continuous probability distributions
  - a. Density and distribution functions
  - b. Uniform, Normal, Gamma, Exponential, Beta distributions
4. Functions of random variables
5. Sampling distributions and Central limit theorem
6. Marginal and conditional distributions

## Course expected 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

## How this online course works

### Mode of delivery

This course is 100% online. The lectures will be a mix of synchronous (live) at the times listed above and asynchronous (recorded lecture videos), I expect approximately 75-80% of the lectures will be synchronous while the remaining will be recorded videos.

### Participation requirements

All lectures regardless of synchronous or asynchronous will be recorded and made available through carmen. I strongly encourage you to attend the live lectures since that will give you an opportunity to engage in the class and ask questions. Each week we will cover approximately 165 minutes of content in total.



## Course materials and technologies

### Textbooks

#### Required

1. *Mathematical Statistics with Applications* (7<sup>th</sup> edition) by Wackerly, Mendenhall and Sheaffer.

This book is available to you (unless you have opted out) through CarmenBooks.

#### Optional

Course material will be supplemented with the freely available books:

1. *R programming for Data Science* by Roger D Peng

<https://bookdown.org/rdpeng/rprogdatascience/Links to an external site.>

2. *R for Data Science* by Garrett Golemund and Hadley Wickham

<https://r4ds.had.co.nz/>

I will also post incomplete lecture notes in Carmen before each class, which will be interactively completed in class through annotation. You are **not required** to study the incomplete lecture notes beforehand.



## Course technology

### Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available [at it.osu.edu/help](https://it.osu.edu/help), and support for urgent issues is available 24/7.

- Self-Service and Chat support: [it.osu.edu/help](https://it.osu.edu/help)
- Phone: 614-688-4357(HELP)
- Email: [8help@osu.edu](mailto:8help@osu.edu)
- TDD: 614-688-8743

### Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen ([go.osu.edu/canvasstudent](https://go.osu.edu/canvasstudent))
- CarmenZoom virtual meetings ([go.osu.edu/zoom-meetings](https://go.osu.edu/zoom-meetings))

### Required Equipment

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

### Required software

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at [go.osu.edu/office365help](https://go.osu.edu/office365help).

### Carmen Access



You will need to use BuckeyePass ([buckeyepass.osu.edu](https://buckeyepass.osu.edu)) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass website for more information: <https://buckeyepass.osu.edu/>
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

## Grading and instructor response

### How your grade is calculated

Assignment Category	Points and/or Percentage
Homework	40%
Midterm Exam	30%
Final Exam	30%
<b>Total</b>	<b>100%</b>



## Description of major course assignments

**Homework:** Homework will be assigned regularly (about 5-6 assignments over the semester). It will consist of numerical problems motivated by data analytics applications and small computer programming/simulation problems. You are encouraged to work together on the problems, but each student must hand in their own work, written in their own words. Do not copy any part of another student's homework including computer 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. **All homework must be submitted online as a PDF file through the class website (carmen).** For written problems you may take a picture of or scan your written solutions and upload them as a PDF file. For R based problems please submit typed solutions. 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. The use of AI is allowed, but remember AI models can make mistakes and you are responsible for the solution you provide.

**Please note late submission of assignments will be penalized at a rate of 10% of points received in the assignment per day they are late. The late penalty may be waived if prior exception has been sought.** If you are unable to complete an assignment on time and need extra time, please get in touch with me as soon as possible so we can discuss your situation.

**Exams:** There will be a **midterm exam and a final exam**. Coverage includes lecture material, assigned reading, and homework. **As per University policy on DH courses, both exams are in-person. These are written exams and are closed book/closed notes.** 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. Makeup exams require a valid excuse and official proof if I am notified in advance or as soon as possible.



## 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

### Grading and feedback

For large weekly assignments, you can generally expect graded homeworks back within **14 days**.

### E-mail

I will reply to e-mails related to course logistics within **72 hours on school days**. However, if you have questions on understanding the course materials or regarding the homework assignments please visit my Zoom office hours, the TA's office hours and Data Analytics Learning Center.

## Academic policies



## Academic integrity policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the [Committee on Academic Misconduct](#) (COAM) expect that all students have read and understand the University's [Code of Student Conduct](#), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute Academic Misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: Any activity that tends to compromise the academic integrity of the University or subvert the educational process. Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an excuse for academic misconduct, so please review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

If an instructor suspects that a student has committed academic misconduct in this course, the instructor is obligated by University Rules to report those suspicions to the Committee on Academic Misconduct. If COAM determines that a student violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University.

If students have questions about the above policy or what constitutes academic misconduct in this course, they should contact the instructor.

## Religious accommodations



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 Civil Rights Compliance: <https://civilrights.osu.edu/>

Policy: [Religious Holidays, Holy Days and Observances](#)

## **Accessibility accommodations for students with disabilities**

### **Requesting accommodations**

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.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; or [slds.osu.edu](http://slds.osu.edu).

### **Intellectual diversity**

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping



them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

## **Creating an environment free from harassment, discrimination, and sexual misconduct**

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office:

Online reporting form at <http://civilrights.osu.edu/>,

Call 614-247-5838 or TTY 614-688-8605,

Or Email [equity@osu.edu](mailto:equity@osu.edu)

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.

The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

## **Copyright for instructional materials**

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.

## **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](http://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 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.



## Course Schedule

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

#	Day	Week	Topic to be covered*	Textbook reading
1	1/12/26	1	Course introduction	1.1
2	1/14/26	1	Introduction to programming with R	
3	1/16/26	1	Characterizing data using numerical and graphical summaries	1.2–1.3
4	1/19/26	2	<b>University holiday, no classes</b>	
5	1/21/26	2	Introduction to probability and counting methods	2.1–2.6
6	1/23/26	2	Introduction to probability and counting methods	2.1–2.6
7	1/26/26	3	Introduction to probability and counting methods	2.1–2.6
8	1/28/26	3	Conditional probability, independence, Bayes' Theorem	2.7–2.10
9	1/30/26	3	Conditional probability, independence, Bayes' Theorem	2.7–2.10
10	2/2/26	4	Conditional probability, independence, Bayes' Theorem	2.7–2.10
11	2/4/26	4	Discrete random variables and probability distributions	3.1–3.2
12	2/6/26	4	Simulation and Monte Carlo (MC) estimation	
13	2/9/26	5	Expected value and variance	3.3
14	2/11/26	5	Bernoulli and Binomial distributions	3.4–3.8
15	2/13/26	5	Bernoulli and Binomial distributions	3.4–3.8
16	2/16/26	6	Negative Binomial, Geometric, Hypergeometric, and Poisson	3.4–3.8
17	2/18/26	6	Negative Binomial, Geometric, Hypergeometric, and Poisson	3.4–3.8
18	2/20/26	6	Continuous random variables, density and distribution functions	4.1–4.3
19	2/23/26	7	Continuous random variables, density and distribution functions	4.1–4.3
20	2/25/26	7	Percentiles and expected values	4.1–4.3
21	2/27/26	7	Uniform distribution	4.4–4.7
22	3/2/26	8	Review for Midterm Exam	
23	3/4/26	8	<b>Midterm Exam (tentative)</b>	



24	3/6/26	8	Normal distribution	4.4–4.7
25	3/9/26	9	Gamma, Exponential, and Beta	4.4–4.7
26	3/11/26	9	Gamma, Exponential, and Beta	4.4–4.7
27	3/13/26	9	Functions of random variables	6.1–6.3
28	3/16/26	10	<b>Spring break, no classes</b>	
29	3/18/26	10	<b>Spring break, no classes</b>	
30	3/20/26	10	<b>Spring break, no classes</b>	
31	3/23/26	11	Functions of random variables	6.1–6.3
32	3/25/26	11	Functions of random variables	6.1–6.3
33	3/27/26	11	Review time	
34	3/30/26	12	Review time	
35	4/1/26	12	Sampling distributions, Central Limit Theorem	7.1–7.3
36	4/3/26	12	Sampling distributions, Central Limit Theorem	7.1–7.3
37	4/6/26	13	Review time	
38	4/8/26	13	Sampling distributions, Central Limit Theorem	7.1–7.3
39	4/10/26	13	Bivariate probability distributions	5.1–5.2
40	4/13/26	14	Marginal and conditional distributions, independent random variables	5.3–5.4
41	4/15/26	14	Marginal and conditional distributions, independent random variables	5.3–5.4
42	4/17/26	14	Marginal and conditional distributions, independent random variables	5.3–5.4
43	4/20/26	15	Conditional expected values	5.11
44	4/22/26	15	Covariance and correlation	5.7
45	4/24/26	15	Bivariate Normal distribution	5.1
46	4/27/26	16	Review for Final Exam	