

Syllabus

STAT:2020

Probability and Statistics for Engineering and Physical Sciences

Fall 2025

The University of Iowa
The College of Liberal Arts and Sciences

► General Information

- **Course:** STAT:2020:0AAA, Probability and Statistics for Engineering and Physical Sciences
- **Location:** 9:30–10:20AM MWF, W10 PBB
- **Textbook:** *Probability & Statistics For Engineers & Scientists*; Walpole, Myers, Myers, Ye; Pearson 2023; ISBN: 9780134115856
- **ICON:** This course will use ICON (<https://icon.uiowa.edu>) – our ICON page will be used for grades, quiz/exam keys, etc. <https://icon.uiowa.edu>
- **Webpage:** Our webpage will be used for announcements, homework assignments, weekly readings, etc.
<https://homepage.stat.uiowa.edu/~mbognar>
- **Administering Department:** Statistics and Actuarial Science, <https://www.stat.uiowa.edu>

► Instructor

- Matt Bognar, matthew-bognar@uiowa.edu, 335-0799
- **Office location:** 358 Schaeffer Hall (SH)
- **Office (drop-in) hours:** 10:30-noon Wednesday, 1:30-3:00 Thursday, or by appointment

► Departmental Executive Officer (DEO)/Department Chair

- Kung-Sik Chan, kung-sik-chan@uiowa.edu

► Course Information

▷ *Course Description*

This course will cover basic probability rules and axioms, random variables, important discrete and continuous distributions, descriptive statistics, point and interval estimation, tests of hypotheses, one-way analysis of variance, simple regression.

▷ *Course Objectives*

- * In this course we will cover the following topics. Since we will cover the following topics in order, you can use this list to focus your reading in the textbook.
 - Counting techniques, probability, conditional probability, Law of Total Probability, Bayes Theorem
 - Random variables (discrete, continuous), cumulative distribution functions, expectation, variance
 - Uniform, binomial, geometric, hypergeometric, negative binomial, Poisson, exponential, and normal distributions
 - Linear combinations of random variables
 - Propagation of error (Delta Method)
 - Sampling distributions, Central Limit Theorem
 - Data collection, summary statistics, graphical displays
 - Inference (confidence intervals and hypothesis testing) for a mean μ (Z and t)
 - Inference for $\mu_1 - \mu_2$ (assuming equal variances)
 - Inference for a proportion p (Wald and Agresti-Coull CIs, score test)
 - Chi-square test for independence, chi-square goodness of fit test
 - Inference for a population variance σ^2
 - One-way ANOVA (including Bonferroni pairwise comparisons)

- Correlation and simple regression (including inference)
- Students will learn how to assess statistical significance for all inference procedures
- * We will learn how to do some of the statistical analyses described in class using the sweet statistical software package *R*. *R* is available in the campus computer labs; it is also available for free at <https://www.r-project.org>. Hand computation will be stressed, however.
- * We will *not* cover all parts of each chapter listed above. Focus your readings on the material that was covered in class (those sections from which homework is assigned). Supplementation to the textbook, when needed, will be provided.

▷ **Learning Outcomes**

- * Upon completion of the course, students will be able to:
 - explain and execute various probabilistic concepts, axioms, and theorems in measuring uncertainty;
 - describe random variables (both discrete and continuous) and their importance in evaluating uncertainty;
 - identify, employ, interpret, and communicate proper inference procedures for a given data analysis problem;
 - explain various probabilistic and statistical paradoxes/fallacies to colleagues;
 - describe univariate and multivariate data, both graphically and numerically;
 - understand how error propagates in a problem;
 - and most importantly, students will learn what questions can be asked (and how to frame them) to better understand data and uncertainty in engineering and the physical sciences.

▷ **Grading**

- * **Exams:** There will be 3 midterms (15% each, 50 minutes in length) and a final exam (25%, 120 minutes in length). Exam dates:
 - Exam 1: Monday, September 22
 - Exam 2: Monday, October 20
 - Exam 3: Monday, November 17
 - Final Exam: Thursday, December 18

Exam dates are also posted on our course website (link is shown near the top of this syllabus). Students are expected to take the exams at the scheduled time. It is your responsibility to make the appropriate arrangements beforehand. If too many conflicts arise from the Friday exam times, the exam will be moved to Wednesday (2 days prior) or Monday (3 days later).

- *It is your responsibility to bring a calculator, pencils, and statistical tables to the exams – borrowing one of these items from your TA or Matt (should we have one available) will result in a 10 point (i.e. 10%) deduction for each item borrowed.*
- Points will be deducted for not following the exam instructions.
- All exams must be completed in the allotted time. Exams not turned-in within the allotted time will not be accepted.
- If you must miss an exam, you must *directly* inform Matt *before* the exam begins. You will be required to provide full, detailed, irrefutable documentation.
- The exam key is released immediately after the exam.
- It is crucial to fill out your exam forms correctly. Points will be deducted for failure to do so.
- * **Quizzes:** (20% total) A quiz will be given during lecture time each Friday (except on exam days). *Make-up quizzes will not be allowed under any circumstances.* The lowest two quiz scores will be dropped.
 - *It is your responsibility to bring a calculator, pencils, and statistical tables to the quizzes – borrowing one of these items from your TA (should he/she have one available) will result in a 5 point (i.e. 25%) deduction for each item borrowed.*
 - *Use your quiz drops wisely.*
- * **Homework:** (10% total) Homework is due before lecture each Friday (it will be submitted using Gradescope). *Late homework will not be accepted under any circumstances.* The lowest two homework scores will be dropped. *Use your homework drops wisely.*

▷ **Grading Notes**

- * Grade cutoffs will be no higher than the usual 90%, 80%, 70%, 60% breakdown.
 - * Final grade cutoffs are not released.
 - * This course uses the $+/-$ grading system (i.e. grades such as A-, B+, and B will be assigned).
 - * The grade of A+ may be given.
 - * Your attendance, participation, preparedness, work ethic, etc. may slightly affect your grade.
 - * Final averages are computed to 2 decimal places.
 - * Your final grade is based solely on your performance in this class. Your final grade can not be negotiated. Scholarships, angry parents, academic standing, etc. are irrelevant to the grade you receive in this course.
 - * Matt reserves the right to give bonus points in lecture via unannounced quizzes, attendance, etc. Bonus points are not available on an individual basis.
- ▷ **Academic Misconduct**
- * All students are expected to abide by the College of Liberal Arts and Sciences (CLAS) standards of academic honesty.
 - * During quizzes and exams, you may not talk, whisper, pass notes, view other students' work, allow a fellow student to view your own work (cover your paper), write-on (or read-from) the desktop, use class notes, etc. Also,
 1. Cell phones may not be used under any circumstances.
 2. Calculators may not be shared.
 3. Statistical tables may not be shared.
 - * Students are expected to finish the homework problems on their own. AI may not be used to complete the homework problems. Websites, chat boards, etc. may not be used to complete the homework problems.
 - * If you finish all homework problems in their entirety, you may then work with a fellow student to compare methods, answers etc. *Simply copying another student's homework will be considered academic misconduct.*
 - * All academic misconduct will receive the following sanctions:
 1. A report will be filed with the UI.
 2. You will receive a 0 on the exam/quiz/homework on which the academic misconduct took place.
 3. **Your final grade will be lowered by 2 full letter grades (e.g. from a B+ to a D+).**
 - * Students are encouraged to contact Matt (or your TA) about fellow students possibly engaging in academic misconduct. Your identity will remain totally anonymous.
- ▷ **Attendance:** Students are required to attend lecture and discussion sections. Lectures/discussions are not recorded. Lecture/discussion notes are not available online.
- ▷ **Artificial Intelligence (AI) Policy:** AI may not be used to complete the work in any part of this course.
- ▷ **Statistics Tutorial Lab:** More information can be found at

<https://www.stat.uiowa.edu/resources/tutoring>

A list of private tutors can also be found here.

► Administrative Information

- ▷ **Course Administrative Home:** The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the add and drop deadlines, academic misconduct policies, and other undergraduate policies and procedures. Other UI colleges may have different policies.
- ▷ **UI Email:** Students are responsible for all official correspondences sent to their UI email address (uiowa.edu) and must use this address for any communication with instructors or staff in the UI community. For the privacy and the protection of student records, UI faculty and staff can only correspond with UI email addresses.
- ▷ **Accommodations for Students with Disabilities:** The University is committed to providing an educational experience that is accessible to all students. If a student has a diagnosed disability or other disabling condition that may impact the student's ability to complete the course requirements as stated in the syllabus, the student may seek accommodations through Student Disability Services (SDS). SDS

is responsible for making Letters of Accommodation (LOA) available to the student. The student must provide an LOA to the instructor as early in the semester as possible, but requests not made at least two weeks prior to the scheduled activity for which an accommodation is sought may not be accommodated. The LOA will specify what reasonable course accommodations the student is eligible for and those the instructor should provide. Additional information can be found on the SDS website.

- ▷ ***Drop Deadline for this Course:*** You may drop an individual course before the drop deadline; after this deadline you will need collegiate approval. You can look up the drop deadline for this course here. When you drop a course, a “W” will appear on your transcript. The mark of “W” is a neutral mark that does not affect your GPA. To discuss how dropping (or staying in) a course might affect your academic goals, please contact your Academic Advisor. Directions for adding or dropping a course and other registration changes can be found on the Registrar’s website. Undergraduate students can find policies on dropping CLAS courses here. Graduate students should adhere to the academic deadlines and policies set by the Graduate College.
- ▷ ***Absences for Religious Holy Days:*** The university is prepared to make reasonable accommodations for students whose religious holy days coincide with their classroom assignments, test schedules, and classroom attendance expectations. Students must notify their instructors in writing of any such religious holy day conflicts or absences within the first few days of the semester or session, and no later than the third week of the semester. If the conflict or absence will occur within the first three weeks of the semester, the student should notify the instructor as soon as possible. See Policy Manual 8.2 Absences for Religious Holy Days for additional information.
- ▷ ***Free Speech and Expression:*** The University of Iowa supports and upholds the First Amendment protection of freedom of speech and the principles of academic and artistic freedom. We are committed to open inquiry, vigorous debate, and creative expression inside and outside of the classroom. Visit the Free Speech at Iowa website for more information on the university’s policies on free speech and academic freedom.
- ▷ ***Non-discrimination Statement:*** The University of Iowa prohibits discrimination in employment, educational programs, and activities on the basis of race, creed, color, religion, national origin, age, sex, pregnancy (including childbirth and related conditions), disability, genetic information, status as a U.S. veteran, service in the U.S. military, sexual orientation, gender identity, or associational preferences. The university also affirms its commitment to providing equal opportunities and equal access to university facilities. For additional information on nondiscrimination policies, contact the Senior Director, Office of Civil Rights Compliance, the University of Iowa, 202 Jessup Hall, Iowa City, IA 52242-1316, 319-335-0705, ui-ocrc@uiowa.edu. Although not required, students have the option to share their pronouns and chosen/preferred names in class and through MyUI. Instructors and advisors can find information about a student’s chosen/preferred name in MyUI.
- ▷ ***Student Complaints:*** Students with a complaint about a grade or a related matter should first discuss the situation with the instructor and finally with the DEO (Chair) of the department, school or program offering the course. Sometimes students will be referred to the department or program’s Director of Undergraduate Studies (DUS) or Director of Graduate Studies (DGS). Undergraduate students should contact CLAS Undergraduate Programs for support when the matter is not resolved at the previous level. Graduate students should contact the CLAS Graduate Affairs Manager when additional support is needed.
- ▷ ***Other Policies:*** <https://provost.uiowa.edu/student-course-policies>