



**STAT 610 – 01 (4 credits)**  
**Introduction to Statistical Inference**  
**Fall 2023**

<b>Location - physical:</b>	133 Service Memorial Institute Mondays & Wednesdays, 9:30 a.m. to 10:45 a.m.
<b>Location - virtual:</b>	Zoom (in special circumstances, see Canvas)
<b>Instructor:</b>	Joshua Cape, Ph.D. <a href="mailto:jrcap@wisc.edu">jrcap@wisc.edu</a> <a href="https://jcape1.github.io/">https://jcape1.github.io/</a>
<b>Office hours:</b>	Mondays, immediately after class
<b>Office - physical:</b>	1250A Medical Sciences Center
<b>TA information:</b>	Zhihao Zhao <a href="mailto:zzhao357@wisc.edu">zzhao357@wisc.edu</a>
<b>TA office hours:</b>	Wednesdays, 3:00 p.m. to 4:00 p.m. in 1275 I Medical Sciences Center Fridays, 2:15 p.m. to 3:15 p.m. in 1275 I Medical Sciences Center
<b>Discussion sections:</b>	Fridays, 11:00 a.m. to 12:15 p.m. in 478 Van Hise Hall Fridays, 1:00 p.m. to 2:15 p.m. in 355 Van Hise Hall

**Course Summary, from the Instructor:**

This course covers the basic theoretical principles of statistical reasoning and data analysis. Emphasis is placed on both mathematical foundations and various techniques of application. Topics include classical parametric estimation, decision theory, hypothesis testing, linear models, analysis of variance, regression, nonparametric and robust procedures, and Bayesian methods.

This course is designed for first-year graduate students, primarily master's and Ph.D. students without an extensive background in mathematical statistics. All students are expected to have a solid understanding of calculus, prior exposure to basic probability and statistics, and basic knowledge of linear algebra.

This course is more advanced than the undergraduate-level course STAT 310 but is less advanced than the Ph.D.-level course STAT 710.

**Course Summary, from the University Course Guide:**

Conditioning, distribution theory, approximation to distributions, modes of convergence, limit theorems, statistical models, parameter estimation, comparison of estimators, confidence sets, theory of hypothesis tests, introduction to Bayesian inference and nonparametric estimation.

**Prerequisites:** STAT 609 or STAT 309 or STAT 431, MATH 521, MATH 340 or equivalent, or consent of the instructor

**Required Text(s):** *Statistical Inference* (2nd edition) by George Casella and Roger Berger. Brooks/Cole CENGAGE.  
ISBN-13: 978-0-534-24318-8  
ISBN-10: 0-534-24312-6

**Other Resources:** Additional materials will be provided on an as-needed basis.

**Objectives and Outcomes:**

After successfully completing this course:

- Students will obtain an understanding of the mathematical foundations underlying statistics.
- Students will be prepared for further graduate-level coursework in statistical theory, methodology, and applications.
- Students will gain experience with problem-solving, technical written communication, and formal reasoning.

**Course Topics:**

We will cover many topics from and pertaining to the following textbook chapters.

**Chapter 5:** Properties of a random sample

**Chapter 6:** Principles of data reduction

**Chapter 7:** Point estimation

**Chapter 8:** Hypothesis testing

**Chapter 9:** Interval estimation

**Chapter 10:** Asymptotic evaluations

**Chapter 11:** Analysis of variance and regression

**Chapter 12:** Regression models

**Assignments:**

- All assignments must be submitted electronically via Canvas.
- Answer each individual problem on a separate page. Make sure to include the problem number at the top of each page. You are not required to re-copy the original problem statements.
- Please create .pdf files by scanning or taking pictures of your handwritten answers. If desired, you may also write up your solutions using a word processor such as MS Word or LaTeX.
- Your submissions *must* be easily readable on a computer. Illegible and/or unorganized submissions risk losing points or not being graded. Do not include scratch notes or otherwise unnecessary material in your homework submission.
- You may work together on homework but submitted solutions must be your own.

**Grading:**

End-of-course letter grades will be based on the following weights.

Assignments	15%
Midterm exam #1	25%
Midterm exam #2	25%
Midterm exam #3	25%
Final exam	10%

The following letter grade cut-offs are guaranteed. They represent worst case scenarios.

90 and above $\Rightarrow$ A	85 and above $\Rightarrow$ AB	75 and above $\Rightarrow$ B
70 and above $\Rightarrow$ BC	60 and above $\Rightarrow$ C	50 and above $\Rightarrow$ D
	Below 50 $\Rightarrow$ F	

Individual class participation may be considered to help decide boundary cases.

**Important Dates:**

Midterm exam #1	Monday, October 9, 2023 – in class
Midterm exam #2	Monday, November 13, 2023 – in class
Midterm exam #3	Monday, December 11, 2023 – in class
Final exam	Thursday, December 21, 2023 – due 9:45 a.m. CT on Canvas

A more detailed class-by-class schedule is available on Canvas and will be updated regularly.

**Policies:**

Students are expected to complete assigned class readings prior to lecture. As a matter of general policy, students who are healthy are expected to attend class meetings. Students who miss class should obtain lecture materials from their classmates and review course recordings (when applicable).

**Late Assignments:**

Homework will be assigned on a regular basis and posted on Canvas. In general, late homework will not be accepted. If you miss a homework deadline due to an unforeseen event, such as illness or a family emergency, your homework score for that particular assignment will be replaced by your average grade on the *remaining* homework assignments.

No make-up exams will be given. Accommodations for a missed exam will be made only if you have a documented and verifiable (i) university-sanctioned conflict on the day and time of the exam or (ii) an illness or family emergency at the time of the exam. You must also adhere to university-wide policies on academic honesty and student conduct.

**Academic Integrity:**

Students in this course must comply with university-wide policy on academic integrity. You may not access unauthorized materials during exams or during the completion of course assignments.

The members of the faculty of the Department of Statistics at UW-Madison uphold the highest ethical standards of teaching, data, and research. They expect their students to uphold the same standards of ethical conduct. Standards of ethical conduct in data analysis and data privacy are detailed on the ASA website (<https://www.amstat.org/ASA/Your-Career/Ethical-Guidelines-for-Statistical-Practice.aspx>), and include:

- Use methodology and data that are relevant and appropriate; without favoritism or prejudice; and in a manner intended to produce valid, interpretable, and reproducible results.
- Be candid about any known or suspected limitations, defects, or biases in the data that may affect the integrity or reliability of the analysis. Obviously, never modify or falsify data.
- Protect the privacy and confidentiality of research subjects and data concerning them, whether obtained from the subjects directly, other persons, or existing records.

By registering for this course, you are implicitly agreeing to conduct yourself with the utmost integrity throughout the semester.

**Copyright Notice:**

These materials may be protected by copyright. United States copyright law, 17 USC Section 101, in addition to university policy and procedures, prohibit unauthorized duplication or retransmission of course materials. Disseminating course materials online, in print, or otherwise, is prohibited.

**Statement on Classroom Recording:**

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

**Classroom Conduct:**

All class participants are expected to treat one another with dignity and respect. Disparaging remarks and discrimination will not be tolerated. Those who violate classroom conduct will be asked to leave, and disciplinary action may be taken in accordance with university policy.

**Diversity and Inclusion:**

The University of Wisconsin–Madison does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the UW's Title IX policy. UW–Madison is committed to taking prompt action to end a hostile environment that interferes with the university's mission. For more information about policies, procedures, and practices, see the university website and handbook.

**Disability Services:**

If you have a disability for which you are or may be requesting an accommodation, please immediately convey this to me and contact the McBurney Disability Resource Center (<https://mcburney.wisc.edu>).

**Accessibility:**

The Canvas LMS platform was built using the most modern HTML and CSS technologies, and it is committed to W3C's Web Accessibility Initiative and Section 508 guidelines. Specific details regarding individual feature compliance are documented and updated regularly.

**Health and Safety Statement:**

It is extremely important that we abide by public health regulations and the university's health standards and guidelines. Depending on university policy, you may be required to wear a face covering or comply with physical distancing rules while in class.

**Religious Observances:**

The observance of cultural practices and religious holidays, defined as activities observed by a religious group of which a student is a member, are an important reflection of diversity. As your instructor, I am committed to providing equivalent educational opportunities to students of all belief systems. At the beginning of the semester, please review the course requirements to identify foreseeable conflicts with assignments, exams, or other required attendance, and contact me within the first two weeks of class.