

Statistics 641
Probability Theory and Mathematical Statistics I
Fall 2025

A. Instructor Information

Name: Garritt Page
office: 2184 WVB
office hours: M W 2:00 - 3:00 p.m.
Other times by appointment
office phone: (801) 422-7269 (I never ever ever receive calls from this number)
email: page@stat.byu.edu

B. Class Information

Class will be held on Tuesday and Thursday from 2:00-3:15 pm in 1166 WVB.

C. TA/Grader Information

Name: Ali Nackos
email: anackos3@byu.edu
office hours: M 11:00-3:00, T 3:30-4:30, W 11:00-2:00, F 11:00-1:00 pm

D. Course Description

This is a three-credit course designed to introduce probability theory. It is a required course for the Master's degree in statistics and one of the courses included in the comprehensive exams.

From Catalog:

Axioms of probability; combinatorics; random variables, densities and distributions; expectation; independence; joint distributions; conditional probability; inequalities; derived random variables; generating functions; limit theorems; convergence results

Prerequisites:

Departmental consent. In general, this course is reserved for students admitted to the Statistics Masters program. To be admitted into the program, you should have had an introductory statistics class, a statistical methods class, multivariate calculus, and linear algebra. I assume that all students have taken these classes.

E. Textbook

Casella, G. and Berger, R. (2002). *Statistical Inference*. Duxbury.

This is a very standard Math Stat book used in Masters and PhD programs in Statistics. It is a good book to have in your personal library. Stat 641 covers approximately the first five chapters. (You'll use this book in Stat 642 as well).

F. Homework

Homework will be assigned weekly. Due dates will be posted on Learning Suite and the homework assignments will be posted on Learning Suite at least one week before the due date. Assignments are due at 11:59 pm on the day of the due date and will be turned in on Learning Suite. The assignments are scheduled to correspond with the lecture material so it is important to hand in assignments on the due date. Late homework will receive no credit, so it is best to turn in homework even if it's not finished. Although homework turned in late won't receive any credit, we will provide feedback on these these assignments. On each assignment, there will likely be one or two problems that are more difficult than exam questions; however, the majority of homework problems will prepare you for exams.

G. Exams: Exams make up the majority of your grade. You will be graded on your problem-solving processes, as well as your final responses.

1. **Midterm Exam:**

There will be one midterm exam in this class. I am planning/hoping this exam takes place in the testing center. But this hasn't been set in stone. Tentative dates on which the exam will take place are.

- Exam 1: Oct 15 – Oct 18

Calculators will not be allowed on any midterm exam. All exams are cumulative.

2. **Final Exam:**

The final exam is scheduled to take place Tues, Dec. 16th from 3:00pm-6:00pm. Plan accordingly.

H. Attendance and In-class Behavior

Attendance in this class is expected. Important announcements will be given in class, and we will also do activities that require attendance. Furthermore, class attendance and class participation may be used in determining the final grade in borderline situations (up to 1% extra credit). You are responsible for any announcements and/or material covered in class. I also expect you to be mentally present in the class, that is that you come ready to learn. Please be respectful to your classmates and leave all distractions (e.g. cell phones) in your backpack. **Please be ON TIME to class.** Punctuality will also be used in determining the final grade in borderline situations.

I. Learning Suite

The syllabus, schedule, homework assignments, solutions, review information, grades, and other material will be available on Learning Suite.

J. Learning Outcomes

Upon successful completion of the course, the student will be able to

1. enumerate the elements of a discrete sample space
2. solve problems using axioms of probability, conditional probability, independence, and Bayes theorem
3. describe the properties of the named distributions
4. manipulate the pdf and cdf of univariate and multivariate discrete and continuous random variables to calculate probabilities and find joint and conditional distributions
5. explore interesting multivariate distributions and their properties
6. find moments and moment generating functions
7. derive distributions for transformed random variables and order statistics
8. use inequalities to create bounds on probabilities and expected values
9. verify convergence in probability and in distribution
10. prove the Central Limit Theorem (iid finite variance version)

K. Grades

Your final score will be computed as follows:

Homework	20%
Midterm Exam	40%
Final Exam	40%
Participation & Attendance	(extra) 1%

and the (minimum) letter grade assigned according to the percentages in the following table:

———	—	95% and above	A	90–95%	A–
85–90%	B+	80–85%	B	75–80%	B–
70–75%	C+	65–70%	C	60–65%	C–

L. Schedule

See Learning Suite.

M. BYU Policies

1. BYU Honor Code

In keeping with the principles of the BYU Honor Code, students are expected to be honest in all of their academic work. Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university. Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university's expectation, and every instructor's expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have questions about those standards.

2. Students Disability

Brigham Young University is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. If you have any disability which may impair your ability to complete this course successfully, please contact the University Accessibility Center (UAC), 2170 WSC or 422-2767. Reasonable academic accommodations are reviewed for all students who have qualified, documented disabilities. The UAC can also assess students for learning, attention, and emotional concerns. Services are coordinated with the student and instructor by the UAC. If you need assistance or if you feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures by contacting the Equal Employment Office at 422-5895, D-285 ASB.

3. Preventing & Responding to Sexual Misconduct

As required by Title IX of the Education Amendments of 1972, Brigham Young University prohibits sex discrimination against any participant in its education programs or activities. The university also prohibits sexual harassment-including sexual violence-committed by or against students, university employees, and visitors to campus. As outlined in university policy, sexual harassment, dating violence, domestic violence, sexual assault, and stalking are considered forms of "Sexual Misconduct" prohibited by the university.

University policy requires any university employee in a teaching, managerial, or supervisory role to report all incidents of Sexual Misconduct that come to their attention in any way, including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Incidents of Sexual Misconduct should be reported to the Title IX Coordinator at t9coordinator@byu.edu or (801) 422-8692. Reports may also be submitted through EthicsPoint at <https://titleix.byu.edu/report> or 1-888-238-1062 (24-hours a day).

BYU offers confidential resources for those affected by Sexual Misconduct, including the university's Victim Advocate, as well as a number of non-confidential resources and services that may be helpful. Additional information about Title IX, the university's Sexual Misconduct Policy, reporting requirements, and resources can be found at <http://titleix.byu.edu> or by contacting the university's Title IX Coordinator.

4. Academic Honesty Policy

The first injunction of the BYU Honor Code is the call to be honest. Students come to the university not only to improve their minds, gain knowledge, and develop skills that will assist them in their life's work, but also to build character. President David O. McKay taught that 'character is the highest aim of education' (The Aims of a BYU Education, p. 6). It is the purpose of the BYU Academic Honesty Policy to assist in fulfilling that aim. BYU students should seek to be totally honest in their dealings with others. They should complete their own work and be evaluated based upon that work. They should avoid academic dishonesty and misconduct in all its forms, including but not limited to plagiarism, fabrication or falsification, cheating, and other academic misconduct.

5. Respectful Environment

"Sadly, from time to time, we do hear reports of those who are at best insensitive and at worst insulting in their comments to and about others... We hear derogatory and sometimes even defamatory comments about those with different political, athletic, or ethnic views or experiences. Such behavior is completely out of place at BYU, and I enlist the aid of all to monitor carefully and, if necessary, correct any such that might occur here, however inadvertent or unintentional."

"I worry particularly about demeaning comments made about the career or major choices of women or men either directly or about members of the BYU community generally. We must remember that

personal agency is a fundamental principle and that none of us has the right or option to criticize the lawful choices of another.” President Cecil O. Samuelson, Annual University Conference, August 24, 2010

“Occasionally, we ... hear reports that our female faculty feel disrespected, especially by students, for choosing to work at BYU, even though each one has been approved by the BYU Board of Trustees. Brothers and sisters, these things ought not to be. Not here. Not at a university that shares a constitution with the School of the Prophets.” Vice President John S. Tanner, Annual University Conference, August 24, 2010

N. Why Study Theory

Excerpt from *Principles of Statistical Inference* by D.R.Cox

Most statistical work is concerned directly with the provision and implementation of methods for study design and for the analysis and interpretation of data. The theory of statistics deals in principle with the general concepts underlying all aspects of such work and from this perspective the formal theory of statistical inference is but a part of that full theory. Indeed, from the viewpoint of individual applications, it may seem rather a small part. Concern is likely to be more concentrated on whether models have been reasonably formulated to address the most fruitful questions, on whether the data are subject to unappreciated errors or contamination and, especially, on the subject-matter interpretation of the analysis and its relation with other knowledge of the field.

Yet the formal theory is important for a number of reasons. Without some systematic structure, statistical methods for the analysis of data become a collection of tricks that are hard to assimilate and interrelate to one another, or for that matter to teach. The development of new methods appropriate for new problems would become entirely a matter of ad hoc ingenuity. Of course such ingenuity is not to be undervalued and indeed one role of theory is to assimilate, generalize and perhaps modify and improve the fruits of such ingenuity.

Much of the theory is concerned with indicating the uncertainty involved in the conclusions of statistical analyses, and with assessing the relative merits of different methods of analysis, and it is important even at a very applied level to have some understanding of the strength and limitations of such discussions. This is connected with somewhat more philosophical issues connected with the nature of probability. A final reason, and a very good one, for study of the theory is that it is interesting.