

MATH 4343: Mathematical Statistics II

Spring 2014

Instructor: Dr. Leif Ellingson
E-Mail: leif.ellingson@ttu.edu Office: MATH 215
Office Hours: TuTH 2 PM—3:30 PM Additional times available by appointment.

Class Meetings: 2:00 – 2:50 MWF in Math 012
Final Exam: Tuesday, May 13 4:30 PM – 7:00 PM

Textbook: *Mathematical Statistics with Applications*, 7th Edition, by Wackerly, Mendenhall, and Scheaffer
Calculator: A graphing calculator (ie. TI-83+, TI-84, or TI-86) is *strongly* recommended, but not required. You must have at least a scientific calculator.
Cell phones and PDAs may NOT be used as calculators!
NO sharing of calculators during exams! Doing so will result in a 0.
Prerequisites: MATH 4342 or consent of the department

Course Objective and Outline

The sequence Math 4342-4343 develops the basic mathematical theory of statistical inference at an undergraduate level. Three semesters of calculus are a prerequisite for this course (Up through Math 2350 or 2450 or equivalent). Math 4342 introduces the concepts and methods of probability and distribution theory. In Math 4343, these tools are used to develop the theory of statistical estimation and hypothesis testing.

Chapter 5: Multivariate Probability Distributions
Chapter 6: Functions of Random Variables
Chapter 7: Sampling Distributions and the Central Limit Theorem
Chapter 8: Estimation
Chapter 9: Properties of Point Estimators and Methods of Estimation
Chapter 10: Hypothesis Testing
Chapter 11: Linear Models and Estimation by Least Squares (if time permits)

Expected Student Learning Outcomes

After completing this course, the student should be able to:

1. Calculate covariance and correlation and determine independence of random variables; obtain expectations and variances for linear combinations of random variables.
2. Find the distribution of a function of random variables using the methods of distribution functions, transformations, and moment generating functions; perform bivariate transformations using Jacobians; calculate joint distributions and moments of order statistics.

3. Calculate probabilities and quantiles for sampling distributions related to the normal distribution (t, chi-square, F); apply the Central Limit Theorem to calculate probabilities and quantiles for the sample mean.
4. Construct point and interval estimators; evaluate their goodness (bias, variance, mean squared error).
5. Determine properties of point estimators (efficiency, consistency, sufficiency); find minimum variance unbiased estimators; find method of moments and maximum likelihood estimators.
6. Perform hypothesis tests for the mean; compute p-values, and probabilities of Type I and Type II errors; determine the power of a test and apply the Neyman-Pearson Lemma; construct likelihood ratio tests.

Methods of Assessing the Expected Learning Outcomes

Assessment of the learning outcomes will be achieved through in-class exams and regularly collected homework assignments.

Grades

Point totals will be rounded to the nearest whole number. For example, a final percentage of 79.4 will be rounded to 79 and the grade will be a C.

A	90—100
B	80—89
C	70—79
D	60—69
F	0—59

There will be 3 midterm exams, regularly collected homework assignments and a cumulative final exam. Your final grade will be calculated using the following formula:

$$\text{Score} = 0.19(\text{Exam 1}) + 0.19(\text{Exam 2}) + 0.19(\text{Exam 3}) + 0.19(\text{HW}) + 0.24(\text{Final})$$

Attendance

Attendance will not directly impact your grade. However, students are expected to attend all lectures, with the exception of excused absences. Students are responsible for *all* material presented and announcements made during class. Announcements for the dates of exams will be announced **in-class** so **it is the responsibility of the student to know when assignments will be and to be prepared for them.**

Exams

A total of **three** midterm exams will be given throughout the semester. These three exams will be given during regularly scheduled lectures and the date for each will be announced at least a week in advance. The final exam will be given during the allotted period of the final examination week.

The exams will be **closed**-book and **closed**-note and are to be completed **individually**. However, *one* 8.5" x 11" handwritten note/formula sheet (no photocopies or computer-generated output) with writing on both sides will be permitted for use. This formula sheet may contain only definitions and formulas and **must** be turned in in with your exam.

While you are strongly encouraged to have a graphing calculator with you for exams, it does not suffice to simply provide calculator output for your answers. Your work to arrive at your answer is just as important as the answer you arrive at, if not more so. Accordingly, unless otherwise stated, you are expected to provide work and/or provide reasoning for you answer. This shows that you understand how to solve the problem as well as leaving open the opportunity to receive partial credit.

All students may perform corrections in order to be eligible to earn **up to half** of the points that were missed on the exam. The details of the policy and instructions for performing the corrections can be found on the last page of this syllabus.

Homework

Collected homework assignments will be due every 1-2 weeks and are to be completed individually. These problems may consist of problems from the textbook as well as problems selected by the instructor from other resources. Completed homework assignments should obey the following rule:

Your solutions should be neatly handwritten, in order, and stapled together. Working on both sides of the paper is fine. If necessary, I encourage you to either work out each problem on a separate piece of paper.

In order to master the material covered in the course, it is essential to work as many problems as possible. As such, a list of suggested practice problems will be provided on the course website. Many/most of these problems will not be collected, but similar problems may appear on exams. In addition to the completion of both types of problems, students are also expected to **read** the chapters in the textbook that correspond to the material covered in lecture. It is the responsibility of the student to keep current and it is crucial that this is done because waiting until the few nights before an exam to work through the problems will make success in the course more difficult.

Make-Ups

Late homework assignments will be accepted up to one school day after the due date and will receive a grade reduction of 20%.

Make-up *exams* will be available in the case of **excused** absences. If you know of an absence in advance, please let me know so that the make-up exam can be given in advance. Otherwise, the make-up exam must be taken within **one week of the day the in-class** exam. Therefore, it is critical that you be aware of exam dates and of any conflicts that may arise and schedule a time to complete the work. Once an appointment

has been set to make-up an assignment, the agreed upon time will be viewed as though it is class, so **missing the make-up without an excused absence will be considered the same as missing class, resulting in a score of 0.**

In most cases, it is up to the discretion of the instructor what will constitute an excused absence, though they will be granted for emergencies, such as a death in the family, or treatment of an injury or illness at a medical facility. They *will* also be granted for absences related to University-affiliated groups, such as trips for recognized student organizations and participation in University-affiliated athletic competitions. In such cases, please inform the instructor ahead of time. **In most cases, documentation is required.** Finally, excused absences will be granted for observance of Religious Holidays according to the official TTU policies described below:

Absences due to Religious Observance

The Texas Tech University Catalog states that a student shall be excused from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

Absences due to Officially Approved Trips

The Texas Tech University Catalog states that the person responsible for a student missing class due to a trip should notify the instructor of the departure and return schedule in advance of the trip. The student may not be penalized and responsible for the material missed. Students absent because of university business will be given the same privileges as other students.

Grade Appeals

A written statement of the grade appeals must be provided within **one week** of the assignment being returned *to the class*. Give the instructor your work in question and a clear, brief explanation of why you think you deserve additional credit.

E-Mail Considerations

Please adhere to the following guidelines when emailing your instructor:

1. E-mail is to be from the TTU domain.
2. E-mail will not contain unexpected attachments.
3. A full first and last name must appear clearly within the body of the e-mail.
4. The course number is clearly indicated in the message.

Classroom Civility

The lecture experience will be greatly enhanced if all students will (1) be prepared for the lecture by reading assigned sections in the text, (2) refrain from talking to your neighbors

unless instructed to do so, (3) arrive promptly before the start of class, (4) turn off audible cell phone and pager signals, (5) avoid using cell phones or other wireless devices during lecture, (6) avoid reading a newspaper during lecture, and (7) participate; ask questions whenever they occur to you.

Help Outside of Class

1. **Me:** Please feel free to ask questions during my office hours, by appointment, or by e-mail. My office hours are not to be used as a substitute for regular class attendance.
2. **Your Classmates:** Talk to other students in the class to see if they can help you. Consider forming small study groups so that each of you can contribute. While I encourage you to study together, collected homework problems must represent your own work.
3. **Private Tutors:** You may hire a tutor. The Department of Mathematics and Statistics has a list of tutors. Contact anyone on that list who mentions willingness to tutor this specific course to inquire about using their services. For more information, please see <http://www.math.ttu.edu/people/Tutor%20List.pdf>.

Course Website

The website for this course is located at <http://www.math.ttu.edu/~lellings/4343/> . In addition to suggested homework exercises, the webpage will contain supplemental material, including probability tables and other resources.

Students with Disabilities

Any student who because of a disability may require special arrangements in order to meet course requirements should contact the instructor as soon as possible to make any necessary accommodations. Student should present appropriate verification from AccessTECH. No requirement exists that accommodations be made prior to completion of this approved university procedure.

Academic Integrity

Is assumed and expected at all times. Students are advised to acquaint themselves with the Code of Student Conduct.

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work that they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension.

Except for changes that substantially affect grading, this syllabus is intended as a guide and is subject to change with advance notice.

Exam Correction Policy

All students in the class may perform corrections for their midterm exams in this course. A corrected exam is eligible to receive up to **at most half** of the points that were missed on the exam. For example, if a student receives a 60% on an exam and successfully completes all of the corrections, 20% of the points will be added to the score so that the student receives a grade of 80% for the exam.

Procedure

1. Test corrections are to be turned in within **one class meeting** from when the exam was handed back in class, barring an excused absence. (unless otherwise noted)
2. In order to receive the maximum number of points back on an exam, you must not only get the problem correct, but also **explain** the solution to the problem to show that you understand the problem and its solution.
3. Test corrections are open book and open note, but they are still part of the exam. As such, they are to be completed **individually**. If I find out about students working together on the corrections, then, **at minimum**, they will forfeit all opportunities to perform corrections for the semester.
4. Test corrections are to be performed on separate sheets of paper from the original examination. The test corrections must be turned in **with the original exam paper**. If the exam is not turned in with the corrections or the corrections are performed on the original exam paper, then the corrections will not be graded.
5. No additional markings should be made on the original exam paper from when it is handed back.
6. Just like homework assignments, exam corrections will be accepted up to **one school day late**, but the corrections will receive a 20% reduction, meaning that only up to 40% of the points missed can be made-up. If an exam is handed back on a Wednesday, for instance, then corrections are due on the immediate Friday and will be accepted on Monday for a 20% reduction.