CS 3130/ENG 3530: Engineering Probability and Statistics

Spring 2025

Instructor:	Shandian Zhe	**Time:**	Tue & Thu 03:40 - 05:00pm
Email:	zhe@cs.utah.edu	**Place:**	ASB 220

Course Page:

- https://www.cs.utah.edu/~zhe/teach/cs3130.html

Teaching Assistant:

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Office Hours: see the regular schedule at https://www.cs.utah.edu/~zhe/teach/cs3130.html and Canvas Syllabus section. Temporary changes (if have to) will be announced in Canvas.

Description:
   This course provides a calculus-based introduction to probability and statistics. It covers fundamental concepts and computational methods, preparing students for careers in electrical and computer engineering, computer and data science, and software development. Additionally, it lays a foundation for advanced study in machine learning and artificial intelligence.

Books: The major textbook for this course is *A Modern Introduction to Probability and Statistics Understanding Why and How*. The book can be accessed online from https://cis.temple.edu/~latecki/Courses/CIS2033-Spring13/Modern_intro_probability_statistics_Dekking05.pdf.
   Another book is recommended for more in-depth study: *All of Statistics, A Concise Course in Statistical Inference*, which can be accessed at https://egrcc.github.io/docs/math/all-of-statistics.pdf.

Prerequisites: 'C-' or better in (MATH 1220 OR MATH 1320 OR MATH 1321 OR AP Calc BC score of 4+) AND (Full Major status in Computer Science OR Computer Engineering OR Electrical Engineering OR Data Science OR Software Development. Basically, students are assumed to be familiar with Calculus.

Getting Help: Take advantage of the instructor and TA office hours (posted on course web page). We will work hard to be accessible to students. Don't be shy if you don't understand something: come to office hours, post questions in Canvas, or speak up in class! Students are encouraged to use a discussion group for additional questions outside of class and office hours. Feel free to post in Canvas regarding any questions related to class: homeworks, schedule, material covered in class. Also feel free to answer questions, the instructors and TAs will also actively be answering questions. However, please do not post **potential homework answers**. Such posts will be immediately removed. All important announcements will be made through Canvas, there is otherwise no class mailing list.

Tentative Course Outline:

- Sample Space & Events

- Law of Sets & Event Operations

- Probability, Conditional Probability

- Total Probability & Bayes' Rule

- Independence, Conditional Independence

- Discrete Random Variables

- Continuous Random Variables

- Probability Density Function (PDF)

- Cumulative Distribution Function (CDF)

- Expectation, Variance

- Covariance, Correlation

- Gaussian Distribution, Bivariate Gaussian

- Identically Independently Distributed (IID)

- Law of Large Numbers

- Central Limit Theory

- Estimation, Bias and Variance

- Confidence Intervals

- Hypothesis Testing

- Linear Regression

Grading Policy:

- Homework Assignments (50%): Around 7 homework assignments, which are typically released every other week. The assignments will mainly be analytical problems. There might be occasionally light programming tasks, typically asking students to show analytical results and/or figures. In such cases, R, Python and/or MATLAB are suggested for use. The submission can be based on latex or a hand-written but scanned PDF.

- Quizzes (20%): A short quiz in Canvas will be taken weekly. **There will be no make-ups for quizzes, but the lowest two will be dropped.**

- Final exam (30%): Closed-book and in-person.

Letter Grade Mapping:
We will round up your numerical score to the closest integer values. For example, 90.5-90.9 will be treated as 91, and 90.1-90.4 will be treated as 90.

Important Dates:

Final Exam .... Wednesday, April 30, 2025, 03:30pm – 5:30pm, closed-book, in classroom (ASB 220)

Table 1: Letter Grade Mapping Table.

92-100	A	80-83	B	67-70	C	55-59	D
88-91	A-	76-79	B-	63-66	C-	50-54	D-
84-87	B+	71-75	C+	60-62	D+	0-49	E

Late Policy: Each assignment must be turned in through Canvas by the designated deadline, usually 11:59pm, to receive full credit. If the deadline is missed, the late submission will have 10% penalty. Then late submissions in every subsequent 24 hours will lose another 10% credit. For example, an 10 points assignment will have 2 points penalty, if it is submitted 30 hours late. However, if the assignment is not turned in until the other assignment have been graded and returned or 48 hours after the deadline, 0 grade will be given.

The homework assignments are released with sufficient time and we usually do not make extensions for the whole class. A personal extension can only be made due to emergent health and/or family issues, such as family emergencies, sudden severe illness like those needs hospitalization, severe accidents, etc. For fairness to other students, we would request documentation for proof, such as doctor's notes and witness's letters. However, *the extension cannot be made due to that the student is busy with other courses or deadlines, or the student needs traveling.*

If you believe there is an error in grading homework assignments, you may request a regrading within **one week** of receiving your grade. **Requests need to be submitted as a Canvas comment in the Grades section.** The request needs to clearly explain why you think your grade needs a change. If the TAs do not process your requests in one week, please send the email to the instructor.

Homework Submission: We welcome homeworks written with LaTex. If you use Latex, we suggest using online Latex Editor Overleaf (https://www.overleaf.com). We will provide latex template for your convenience. We also accept a hand-written but scanned version. All the homework assignments must be uploaded through Canvas. If there is a programming task, we also request the submission of the source code.

Attending the Final Exam: If you are unable to take the final exam at the scheduled time, please contact the instructor ahead, and we might be able to schedule another time for you.

If you miss the final exam due to emergency, please notify the instructor within 3 days of the exam and provide proof document. Then we can consider scheduling a make-up exam.

Academic Policy: This course follows School of Computing (SoC) Polices/Guidelines (http://www.cs.utah.edu/socguidelines/). Please read it carefully.

If a student is caught cheating on a homework assignment or quiz, they will receive a failing grade for the course. For a detailed description of the university policy on cheating, please see the University of Utah Student Code: http://www.regulations.utah.edu/academics/6-400.html.

Collaboration policy: For assignments, students can discuss answers with anyone, but must write their own solutions. If you collaborated with another student such that you expect the answers may look similar, you must explain explicitly in the homework submission to what extent you have collaborated. Students' homework submissions appearing too similar to others and without collaboration explanation will receive 0 grades.

For the final exam, discussing with anyone (except for instructors/TAs) during the exam period is NOT allowed, and will result 0 grade on the exam.

Students with Disabilities
Please let us know at your earliest convenience. The University of Utah seeks to provide equal access to

its programs, services, and activities for people with disabilities. If you need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.