



DTX 495: Designing with Data

Quantitative Reasoning for Human Systems

Siebel Center for Design | Fall 2026

Course Information

Credits	Prerequisites	Format
2 credit hours	None	Lecture / discussion / applied lab

Instructor Information

Instructor: SCD Adjunct or Noelyn Stephens

Title: Siebel Center for Design, University of Illinois Urbana-Champaign

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Office: Siebel Center for Design, 1040 Sunrise Studio

Office hours: Tuesday/Thursday, 9:30 a.m. to 10:50 a.m.

Course site: [Canvas link]

Course Description

Every day, people make decisions about systems that touch millions of lives: how long someone waits in an emergency room, which neighborhoods get bus routes, how a platform decides what you see next. Those decisions are rarely made based on instinct. They are made with data, whether the decision-maker knows it or not.

This course is built on a simple provocation: the practice of understanding human needs and designing better systems is not just a qualitative endeavor. Done rigorously, it is one of the most demanding forms of quantitative reasoning there is. These are the same questions that drive human-centered practice across every field, except here, students learn to answer them with data.

Students will learn how to define what should be measured, interpret what data actually shows, reason carefully about uncertainty, build simple models of how systems behave, and evaluate tradeoffs when there is no perfect answer. Every concept is taught through real datasets from domains that shape everyday life: healthcare, transportation, technology platforms, and education.

No programming required. Just clear, careful thinking about numbers, systems, and the people inside them.

The Questions We Are Asking

This course is organized around four questions that practitioners in every field wrestle with:

#	Question	What you will learn to do	Domain examples
1	What should we measure?	Define variables, choose metrics, and recognize when a number fails to capture what matters	<i>Hospital readmission rates, transit on-time performance</i>
2	What does the data actually show?	Interpret distributions, correlations, and probabilistic claims without over-reading or under-reading them	<i>Platform engagement metrics, education outcome gaps</i>
3	How does this system work?	Build simple quantitative models of flows, networks, and feedback loops	<i>Emergency department wait times, social media diffusion</i>
4	What should we do?	Evaluate competing solutions using decision frameworks, weighted tradeoffs, and evidence from structured experiments	<i>Bus route redesign, healthcare triage protocols</i>

Learning Outcomes

By the end of this course, students will be able to:

- Interpret quantitative data describing the performance of human systems, including healthcare delivery, public transportation, technology platforms, and education.
- Compute and interpret descriptive statistics, including measures of center, spread, and distribution shape.
- Evaluate relationships between variables using correlation and recognize the difference between correlation and causation.
- Apply probability concepts to reason about uncertainty, risk, and decision-making under incomplete information.

- Construct and interpret simple quantitative models of system behavior, including flows, constraints, and feedback.
- Use quantitative decision frameworks, including weighted scoring models, to evaluate competing design solutions.
- Recognize bias, error, and limitations in datasets, metrics, and quantitative models.
- Communicate quantitative reasoning clearly in written analysis and visual presentation.

Prerequisites

None. This course is open to all students at the University of Illinois, regardless of major or prior coursework.

Course Materials

Learning Management System

This course uses Canvas (canvas.illinois.edu). All readings, assignments, datasets, and announcements will be posted there.

Course Readings

There is no required textbook. Readings will be distributed through Canvas and include case studies, data journalism, policy reports, and short academic readings. Students should expect approximately 40-60 pages of reading per week.

Materials and Software

The primary quantitative tool in this course is a spreadsheet (Google Sheets or Microsoft Excel). Both are freely available to Illinois students. No programming experience or statistical software is required. If you already know Python or R, you are welcome to use them for assignments, but no extra credit is given for doing so.

Grading Scale

Percentage	Letter Grade
93.00 – 100.00	A
90.00 – 92.99	A–
87.00 – 89.99	B+
83.00 – 86.99	B
80.00 – 82.99	B–
77.00 – 79.99	C+
73.00 – 76.99	C
70.00 – 72.99	C–
60.00 – 69.99	D
Below 60.00	F

Late Assignment Policy

Assignments submitted late without prior arrangement will receive a 10% deduction per day, up to five days. Work submitted more than five days late will not be accepted without instructor consent. If you anticipate difficulty meeting a deadline, contact the instructor before the due date.

Requesting an Extension (Only Applicable to Projects)

It is the student's responsibility to ensure that they have allotted enough time to complete each project. Each project will be due on a Thursday at 10 pm. Once a student becomes aware of any issues that will make it impossible to submit a project by the deadline, it is the student's responsibility to email the instructor by 11:59 pm on the Monday before the project deadline. Request for an extension after the Monday before a deadline will not be granted.

To allow for last-minute changes, each project deadline will have an automatic extension of 10 minutes. No further extensions for late submissions will be given on the due date, except in the case of exceptional medical or other documented circumstances.

If you need an extension, do not delay in asking for it. Provided that it is requested by 11:59 pm the Monday before the project is due, the extension will likely be granted. All extensions must be confirmed by an email from the instructor.

Note: No extension will go beyond December 9th. All work must be submitted by December 9th, no exceptions.

Quantitative Reasoning in This Course

Students engage in quantitative reasoning through the following methods across all modules.

QR Method	How it appears in the course
Descriptive statistics	Students compute and interpret summary statistics from real datasets in problem sets and the Metric Audit
Probability and expected value	Students solve probability scenarios and evaluate risk under uncertainty
Correlation analysis	Students calculate and interpret correlation coefficients using real public health and transportation data.
Quantitative modeling	Students build spreadsheet-based flow and network models and the System Model assignment.
Decision frameworks	Students construct and use weighted scoring matrices to evaluate competing design solutions
Experimental reasoning	Students design and evaluate structured experiments to test design interventions

Real Datasets and Cases

The course uses publicly available data throughout. No datasets are invented or simplified beyond what is needed for classroom use. Below are sample data sources (*subject to change*)

Domain	Dataset / Source	Used in
Healthcare	CMS Hospital Compare (hospital quality metrics, readmission rates)	<i>Assignments</i>
Transportation	Chicago Transit Authority open data (ridership, on-time performance)	<i>Final Project option</i>
Public health	CDC PLACES (community health indicators by census tract)	<i>Assignments</i>
Education	Illinois Report Card data (school performance, demographics)	<i>Assignments / Final Project option</i>

Technology	FTC and academic data on platform engagement and algorithmic systems	<i>Assignments</i>
Local / campus	UIUC institutional data (dining, transit, housing)	<i>Assignments / Final Project option</i>

Campus Academic Policies and Statements

Academic Integrity

The University of Illinois Urbana-Champaign Student Code (<https://studentcode.illinois.edu/>) should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy (<https://studentcode.illinois.edu/article1/part4/1-401/>). Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Students with Disabilities

To obtain disability-related academic accommodations, disabled students must contact Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, please visit 1207 S. Oak Street, Champaign, call (217) 333-1970, email disability@illinois.edu, or visit <https://dres.illinois.edu/>.

Students who have a letter of accommodation from DRES are advised to share that with the instructor as soon as possible to ensure accommodation needs can be discussed and met.

Mental Health

Significant stress, mood changes, excessive worry, substance/alcohol misuse or interferences in eating or sleep can have an impact on academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Health Service Fee. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below.

- Counseling Center: (217) 333-3704
- McKinley Health Center: (217) 333-2700
- National Suicide Prevention Lifeline: (800) 273-8255
- Rosecrance Crisis Line: (815) 720-4953 (available 24/7)

Community of Care

As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regard to their well-being or yours, we encourage you to refer this behavior to the Connie Frank CARE Center in the Office of the Dean of Students at (217) 333-0050 or via <https://odos.illinois.edu/community-of-care/referral>.

Religious Observances

It is the policy of the University of Illinois Urbana-Champaign to reasonably accommodate its students' religious beliefs, observances, and practices that conflict with a student's class attendance or participation in a scheduled examination or work requirement. Students must make requests for accommodation in advance of the conflict. Requests should be directed to the instructor.

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. Other information about resources and reporting is available at <https://wecare.illinois.edu/>.

Emergency Response Recommendations

Emergency response recommendations and campus building floor plans can be found at the Public Safety Run, Hide, Fight website: <https://police.illinois.edu/em/run-hide-fight/>. Please review this website within the first 10 days of class.

Family Educational Rights and Privacy Act (FERPA)

See <https://registrar.illinois.edu/academic-records/ferpa/> for more information on FERPA.