

# DAEN 427 Decision and Risk Analysis

Fall 2026

## Course Information

**Time (Location)** Mon-Wed-Fri 11:30–12:20 AM 3 *credit hours* (ETB 1027)

**Prerequisites** Grade of C or better in ISEN 310, DAEN 321, or STAT 212

**Cross listing** ISEN 427 / ISEN 627

**Instructor** Alexander Abuabara <mailto:abuabara@tamu.edu>

**Course office hours (location)** Wed 1-3 PM or by appointment (ETB 4013)

## Description

Overview of the state of the art in descriptive and prescriptive theories of decision making under uncertainty with emphasis on the ways in which human decisions depart from normative models of rationality; analytical foundations stemming from several disciplines, economics, psychology, management science; application in engineering systems will be considered.

## Outcomes

1. Apply Bayesian approach to perception and decisions under uncertainty.
2. Implement computational models for Bayesian inference and strategic decision support.
3. Use concepts from economics, psychology, and management science to analyze decision-making processes.

## Recommended Resources

- Bayes Rules! An Introduction to Applied Bayesian Modeling <https://www.bayesrulesbook.com/>.
- ... Bayesian Inference, Methods, Computation <https://link.springer.com/book/10.1007/978-3-030-82808-0>.
- A Course in Behavioral Economics <https://www.erikangner.com/a-course-in-behavioral-economics>.
- R <https://cran.r-project.org/>, RStudio (IDE) <https://posit.co/download/rstudio-desktop>.

## Grading

Assessment	Weight	Description
Exam (2)	58% (29% each)	Content on weeks 1–5 & 1–11
Project (report + presentation)	28% (groups of 2)	Case study exploring decision and risk analysis in engineering
Participation / Activities	14%	In-class quizzes and discussions, assignments, practice questions

Grades are based on total points earned: A ≥ 90%, B ≥ 80%, C ≥ 70%, D ≥ 60%, F < 60%.

## Schedule (*tentative*)

Lecture	Topic	Chapter
1	Bayesian thinking for risk and decision analysis	Ch. 1
2	Bayesian updating and evidence accumulation	Ch. 2
3	Prior modeling and expert knowledge	Ch. 3–4
4	Bayesian simulation and uncertainty propagation	Ch. 5–6
5	MCMC and computational Bayesian inference	Ch. 7
Sep 28	<b>Exam 1: Bayesian foundations + computation</b>	<b>Ch. 1–7</b>
6	Bayesian workflow and model validation	Ch. 8
7	Bayesian regression for risk modeling	Ch. 9
8	Bayesian prediction and model comparison	Ch. 10
9	Multiple regression and decision drivers	Ch. 11
10	Bayesian count models and rare events	Ch. 12
11	Bayesian classification and logistic risk models	Ch. 13–14
Nov 9	<b>Exam 2: Predictive modeling + risk analysis</b>	<b>Ch. 1–14</b>
12	Hierarchical Bayesian models	Ch. 15–16
13	Advanced multilevel and structured uncertainty models	Ch. 17–18
14	Bayesian decision analysis and probabilistic forecasting	Ch. 19
Nov 30/Dec 1	<b>Final project: probabilistic programming, risk communication</b>	<b>Ch. 1–19</b>

## **Policies**

- Be nice. Be honest. Don't cheat. Adhere to all University Policies.
- Course material is cumulative and requires consistent effort. All assignments must be completed carefully and on time. Presentation quality (organization, clarity, tables, graphs, and discussion) is part of grading.
- Excused absences apply only to attendance and in-class activities and do not extend assignment deadlines. Alternative arrangements must be made prior to the deadline.
- Regrade applies to the entire submission. To ensure fairness and timely feedback, no changes after one week.
- Email is the primary form of communication; include the course number in the subject line. Responses should not be expected after 5:00 PM, on weekends, or on holidays.
- All assignments must be submitted through Canvas. If technical issues prevent submission, send your assignment from your @tam.u.edu email to the instructor's @tam.u.edu email as a backup. The subject line must include the course number and assignment name. Late work is not accepted and will receive a grade of zero.
- Audio or video recording of lectures or any portion of the course is prohibited without written instructor permission. Unauthorized recording constitutes a violation of student conduct.
- Headphones and non-class-related browsing are not permitted during class.

## **University Policies**

### **Attendance**

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments. Please refer to Student Rule 7 in its entirety for information about excused absences, including definitions, and related documentation and timelines.

### **Student Observances for Religious Holy Days**

In accordance with Texas Education Code §51.911(b) and Texas A&M Student Rule 7: Attendance, students 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. For more information about excused absences due to religious holy days, please visit the Faculty Affairs website (under Other University Guidelines).

### **Makeup Work**

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor. Please refer to Student Rule 7 in its entirety for information about makeup work, including definitions, and related documentation and timelines. Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor (Student Rule 7, Section 7.4.1). "The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" (Student Rule 7, Section 7.4.2). Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See Student Rule 24.)

### **Academic Integrity Statement**

"An Aggie does not lie, cheat or steal, or tolerate those who do." "Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" (Section 20.1.2.3, Student Rule 20). You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](https://aggiehonor.tamu.edu).

### **Plagiarism**

According to the Texas A&M University Definitions of Academic Misconduct, plagiarism is the appropriation of another person's ideas, processes, results or words without giving appropriate credit ([aggiehonor.tamu.edu](https://aggiehonor.tamu.edu)). You should credit your use of anyone else's words, graphic images, or ideas using standard citation styles. AI text generators (ChatGPT, Google Bard, etc.) should not be used for any work for this class without explicit permission of the instructor and appropriate attribution. This includes, but is not limited to: (i) creating or revising drafts, (ii) editing your work, (iii) reviewing a peer's work. This excludes pre-existing software additions such as spelling and grammar checkers, which are acceptable. Such use of AI text generators in this manner could be considered plagiarism and cheating according to Student Rule 20. More information may also be found at <https://aggiehonor.tamu.edu> or you may contact your instructor if you have questions.

### **Americans with Disabilities Act (ADA)**

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact the Disability Resources office

on your campus. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible. Disability Resources is in the Student Services Building or at (979) 845-1637 or visit <https://disability.tamu.edu>.

### **Title IX and Statement on Limits to Confidentiality**

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking. With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see University Rule 08.01.01.M1): (i) the incident is reasonably believed to be discrimination or harassment, (ii) the incident is alleged to have been committed by or against a person who, at the time of the incident, was a student or employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Students wishing to discuss concerns related to mental and/or physical health in a confidential setting are encouraged to make an appointment with University Health Services or download the TELUS Health Student Support app for 24/7 access to professional counseling in multiple languages. Walk-in services for urgent, non-emergency needs are available during normal business hours at University Health Services locations; call 979.458.4584 for details. Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's Title IX webpage.

### **Statement on Mental Health and Wellness**

Texas A&M University recognizes that mental health and wellness are critical factors influencing a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-care practices by utilizing the resources and services available through University Health Services. The TELUS Health Student Support app provides access to professional counseling in multiple languages anytime, anywhere by phone or chat, and the 988 Suicide & Crisis Lifeline offers 24-hour emergency support at 988 or <https://988lifeline.org>.

### **Pregnancy Accommodations**

Texas A&M provides reasonable accommodations to students due to pregnancy and/or related conditions, such as childbirth, recovery and lactation. Students should contact the University's Pregnancy Coordinator as soon as they become aware of the need for accommodation. Depending on the circumstances, accommodations could include extended time to complete assignments or exams, changes in course sequence, or modifications to the physical classroom environment. Texas A&M will also allow a voluntary leave of absence, ensure the availability of lactation space, and maintain grievance procedures to provide for the prompt and equitable resolution of complaints of sex discrimination. For information regarding pregnancy accommodations, email [TIX.Pregnancy@tamu.edu](mailto:TIX.Pregnancy@tamu.edu).