

# Decision Analysis, ISE 562

Course ID's: 20243\_31562: Decision Analysis (31562D, 31728-DEN)  
(Tuesday Thursday + DEN)  
Fall 2024 Course Syllabus  
Dr. Smith

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Contact Info: Value and Decision Analysis, ISE 562

Dr. Jeffrey H. Smith

Office Hours: Tuesday/Thursday 2-3:30p, after class, zoom appointment, or email.  
Location: 242B  
Email: [jeffs@usc.edu](mailto:jeffs@usc.edu)

TA

Mohammadmehdi Naghiaei  
Office hours: 1-2p Wednesday  
Location: OHE 310S or Zoom  
Zoom ID: See class notes for ID  
Email: [naghiaei@usc.edu](mailto:naghiaei@usc.edu)

## Importance of this course:

As the dramatic consequences of engineering and business decisions (both good and bad) demonstrate the power to generate vast wealth or drive prosperous corporations into bankruptcy, decision making under risk and uncertainty is a crucial skill. It has become a cornerstone of modern data analytics for mining, processing, and extracting knowledge. This course is designed to enable the student to formulate, collect, analyze, frame, and interpret decision making information for selecting the "best" alternative action.

## Course Description

The course is presented in 4 phases. The first phase presents a classical Bayesian decision approach and the components of decision making; the second phase explores the Keeney-Raiffa multiattribute (utility) decision analysis methodology; the third phase examines group decision making; and the fourth phase examines behavioral issues of decision making (e.g., framing and biases). The topics are summarized below.

Chapter 1,2, Probability Review	Basic concepts, definitions of probability
Chapter 3, Discrete Bayes Methods	Decision making distributions for discrete random variables
Chapter 4, Continuous Bayes Methods	Decision making distributions for continuous random variables
Chapter 5, Decision Theory, Introduction to Utility Functions	Structuring decision problems
Chapter 6, Value of Information	EVPI, EVSI
Multi-attribute decision analysis	Multiple decision variables
Group decision making	Group decision rules
Decision biases	Psychological and behavioral decision issues; framing

Suggestions (for success)

You should read over the reading assignments before the corresponding lecture.  
 You should attempt the homework (at least once) on your own before asking for help.  
 Make an honest attempt to understand the material before uttering the words, "I don't get this."

Course Prerequisite Knowledge  
 ISE 220, 225, or equivalent; Calculus.

Course Goals  
 Students will learn:

- tools and techniques of decision theory for single, multiple attributes, behavioral problems
- how and when to apply the tools
- practice application of the tools with homework exercises

Text  
 Winkler, Robert L., An Introduction to Bayesian Inference and Decision, Second Edition, Probabilistic Publishing, Inc., Gainesville, Florida, 2003.

Course Requirements and Grades  
 The course requirements are as follows:

Requirement	Point Total
3 Homework assignments @ 10 points	30
Midterm Exam	25
Project*	20
Final Exam	25
Course Total	100

Submit assignments to [ise562hw@gmail.com](mailto:ise562hw@gmail.com).

The project will be announced after submission of homework assignment 2 and will be graded according to attributes of creativity, relevance, content, organization, and timeliness (4 pts each). All grading issues are closed after 2 weeks from the original due date. Late homework—40% off per day.

Schedule (Note: homework due on date shown.)

Date	Topic	Readings	Assignments/Notes
Tue. August 27	Introduction, Review	Chapter 1, 2	
Thu. Aug. 29	Review	Chapter 2	
Tue. Sep 3	Discrete Bayes Methods	Chapter 3	
Thu. Sep 5	Discrete Bayes Methods	Chapter 3	
Tue. Sep 10	Continuous Bayes Methods	4.1- 4.9	
Thu. Sep 12	Continuous Bayes Methods	4.1- 4.9	
Tue. Sep 17	Decision making criteria	5.1 - 5.4	
Thu. Sep 19	Utility concepts	5.5 - 5.8	
Tue. Sep 24	Utility concepts	5.5 - 5.8	
Thu. Sep 26	The Decision Problem	5.9 - 5.10	HW1 due
Tue. Oct 1	The Decision Problem	5.9 - 5.10	
Thu. Oct 3	Midterm review		
Tue. Oct 8	Midterm		
Thu. Oct 10	No Class—Fall Break		
Tue. Oct 15	Value of Perfect Information	6.1 - 6.2	
Thu. Oct 17	Value of Sample Information	6.3	
Tue. Oct 22	Value of Sample Information	6.3	
Thu. Oct 24	Multiattribute Decision Problems	Notes	
Tue. Oct 29	Multiattribute Decision Models	Notes	HW2 due
Thu. Oct 31	Multiattribute Decision Analysis under uncertainty	Notes	
Tue. Nov 5	Comparing decision models	Notes	
Thu. Nov 7	Practical guide for gathering decision data inputs	Notes	
Tue. Nov 12	Group Decision Making	Notes	
Thu. Nov 14	Group Decision Making	Notes	
Tue. Nov 19	Group Decision Making	Notes	
Thu. Nov 21	Decision making biases	Notes	
Tue. Nov 26	Decision making biases	Notes	HW 3 due
Thu. Nov 28	No Class—Thanksgiving recess		
Tue. Dec 3	Improving decision making	Notes	
Thu. Dec 5	Improving decision making; Last class	Notes	Project due
Dec 17	Final Exam,: Tues. Dec 17, 11-1 pm.	Location classroom	

## Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations is from DSP. Please be sure I receive the letter as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Tuesday through Friday. Website and contact information for DSP:

[http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html), (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) [ability@usc.edu](mailto:ability@usc.edu).

## Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards”

[policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, [policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct).

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call

[engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

[suicidepreventionlifeline.org](http://suicidepreventionlifeline.org)

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call

[engemannshc.usc.edu/rsvp](http://engemannshc.usc.edu/rsvp)

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086

[equity.usc.edu](http://equity.usc.edu), [titleix.usc.edu](http://titleix.usc.edu)

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421

[studentaffairs.usc.edu/bias-assessment-response-support](http://studentaffairs.usc.edu/bias-assessment-response-support)

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

[dsp.usc.edu](http://dsp.usc.edu)

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

[studentaffairs.usc.edu/ssa](http://studentaffairs.usc.edu/ssa)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101  
diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call  
dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call  
dps.usc.edu

Non-emergency assistance or information.

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies. Please activate your course in Blackboard with access to the course syllabus. Whether or not you use Blackboard regularly, these preparations will be crucial in an emergency. USC's Blackboard learning management system and support information is available at [blackboard.usc.edu](http://blackboard.usc.edu).