

# Value and Decision Analysis, ISE 562

Spring 2007  
Dr. Smith

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Contact Info: Value and Decision Analysis, ISE 562

Dr. Jeffrey H. Smith

### Office Hours

Monday 3:30-4:30 pm, after class, or by appointment.  
Location: GER 235  
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Office hours: Tuesdays 1-3 pm or by appt.  
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### 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 without doubt a crucial skill. 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; the second phase explores the Keeney-Raiffa multiattribute decision analysis methodology; the third phase covers group decision making; and the fourth phase examines behavioral issues of decision making (e.g., framing). 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
Multiattribute 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 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 and working knowledge of Calculus.

Course Goals

Students will learn:

- tools and techniques of decision theory for single and multiple attribute 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

The project will be announced after submission of homework assignment 3 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 homeworks—40% off per day.

Schedule Note: homework due in class on date shown.

Date	Topic	Readings	Assignments/Notes
Mon Jan 8	Introduction, Review	Chapter 1, 2	
Wed Jan 10	Review	Chapter 2	
Mon Jan 15	No Class, MLK Day		
Wed Jan 17	Discrete Bayes Methods	Chapter 3	
Mon Jan 22	Discrete Bayes Methods	Chapter 3	
Wed Jan 24	Continuous Bayes Methods	Chapter 4	
Mon Jan 29	Continuous Bayes Methods	Chapter 4	
Wed Jan 31	Decision making criteria	5.1 - 5.4	
Mon Feb 5	Utility concepts	5.5 - 5.8	
Wed Feb 7	Utility concepts	5.5 - 5.8	HW1 due
Mon Feb 12	The Decision Problem	5.9 - 5.10	
Wed Feb 14	The Decision Problem	5.9 - 5.10	
Mon Feb 19	No class, President's Day		
Wed Feb 21	Midterm review		
Mon Feb 26	Midterm		
Wed Feb 28	Value of Perfect Information	6.1 - 6.2	
Mon Mar 5	Value of Perfect Information	6.1 - 6.2	
Wed Mar 7	Value of Sample Information	6.3	
Mar 12, 14	No class, Spring Recess		
Mon Mar 19	Value of Sample Information	6.3	
Wed Mar 21	Multiattribute Decision Problems	Notes	HW2 due
Mon Mar 26	Multiattribute Decision Models	Notes	
Wed Mar 28	Multiattribute Decision Analysis under uncertainty	Notes	
Mon Apr 2	Comparing decision models	Notes	
Wed Apr 4	Practical guide for gathering decision data inputs	Notes	
Mon Apr 9	Group Decision Making	Notes	
Wed Apr 11	Group Decision Making	Notes	
Mon Apr 16	Decision making biases	Notes	
Wed Apr 18	Decision making biases	Notes	HW 3 due
Mon Apr 23	Decision making biases	Notes	
Wed Apr 25	Improving decision making	Notes	Project due; Last day of class
Mon May 7	Final Exam, 2-4 pm.		

Academic Integrity

*"The Viterbi School of Engineering adheres to the University's policies and procedures governing academic integrity as described in SCampus. Students are expected to be aware of and to observe the academic integrity standards described in SCampus, and to expect those standards to be enforced in this course".*

Disability Accommodation

*"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 can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213)740-0776".*