Value and Decision Analysis, ISE 562

Course ID: 31562D, 31762D, OHE 100B
Fall 2013
Dr. Smith

Note differences between ISE 562 and ISE 500
ISE 562: Engineering-focused decision analysis models; making optimal single, multi-attribute, and group decisions (making better decisions).
ISE 500: Management-focus; ~½ basic decision analysis + ½ ISE 225 topics (ANOVA, regression, and confidence intervals).

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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.
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TA: TBD
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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 and the components of decision making; the second phase explores the Keeney-Raiffa multiattribute (utility) decision analysis methodology; the third phase covers group decision making; 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
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 (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, 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 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 homeworks—40% off per day.

Schedule Note: homework due in class on date shown.

Date	Topic	Readings	Assignments/Notes
Mon. August 26	Introduction, Review	Chapter 1, 2	
Wed. Aug. 28	Review	Chapter 2	
Mon. Sep 2	Labor Day—No Class		
Wed. Sep 4	Discrete Bayes Methods	Chapter 3	
Mon. Sept 9	Discrete Bayes Methods	Chapter 3	
Wed. Sept 11	Continuous Bayes Methods	4.1- 4.9	
Mon. Sept 16	Continuous Bayes Methods	4.1- 4.9	
Wed. Sept 18	Decision making criteria	5.1 - 5.4	
Mon. Sept 23	Utility concepts	5.5 - 5.8	
Wed. Sept 25	Utility concepts	5.5 - 5.8	
Mon. Sept 30	The Decision Problem	5.9 - 5.10	HW1 due
Wed. Oct 2	The Decision Problem	5.9 - 5.10	
Mon. Oct 7	Midterm review		
Wed. Oct 9	Midterm		
Mon. Oct 14	Value of Perfect Information	6.1 - 6.2	
Wed. Oct 16	Value of Perfect Information	6.1 - 6.2	
Mon. Oct 21	Value of Sample Information	6.3	
Wed. Oct 23	Value of Sample Information	6.3	
Mon. Oct 28	Multiattribute Decision Problems	Notes	
Wed. Oct 30	Multiattribute Decision Models	Notes	HW2 due
Mon. Nov 4	Multiattribute Decision Analysis under uncertainty	Notes	
Wed. Nov 6	Comparing decision models	Notes	
Mon. Nov 11	Practical guide for gathering decision data inputs	Notes	
Wed. Nov 13	Group Decision Making	Notes	
Mon. Nov 18	Group Decision Making	Notes	
Wed. Nov 20	Decision making biases	Notes	
Mon. Nov 25	Decision making biases	Notes	HW 3 due
Wed. Nov 27	No Class—Thanksgiving recess		
Mon. Dec 2	Improving decision making	Notes	
Wed. Dec 4	Improving decision making	Notes	Project due
Friday Dec 13	Final Exam, 2-4 pm.	Location TBD	

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 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. Website and contact information for DSP: 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.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/. Information on intellectual property at USC is available at: http://usc.edu/academe/acsen/issues/ipr/index.html.

Emergency Preparedness/Course Continuity in a Crisis

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.