

Iowa State University
Department of Industrial and Manufacturing Systems Engineering
IE 564: Decision Analysis in System Design
Spring 2017

Instructor: Dr. Caroline Krejci
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Meeting Times: TTh 8:00 a.m.-9:15 a.m.
HOWE 1324
Office Hours: TTh 1:30 p.m.-3:00 p.m.
or by appointment

Course Objectives: Upon completion of this course, students will be able to:

- Describe different forms of cognitive decision bias and explain how they can be mitigated to improve decision quality
- Identify the key stakeholders for a decision problem and determine the requirements and salience of each
- Structure and evaluate multi-criteria decision analysis problems by applying multi-attribute utility theory and analytic hierarchy process
- Build Monte Carlo simulation models and interpret simulation output to assess risk in decision problems
- Formulate and solve decision problems with uncertainty using decision trees
- Perform research by gathering and analyzing information from scholarly materials, and share this new knowledge with others, via written reports and oral presentations
- Function effectively on a multi-disciplinary team, in which team members are geographically distant from one another

Prerequisites: STAT 231 and IE 305, or permission of instructor.

Textbook (required): Chelst, K. and Y.B. Canbolat (2012). *Value-Added Decision Making for Managers*, CRC Press, New York, NY (ISBN: 978-1-4200-7572-4)

Software: Included in your textbook is a software package (Logical Decisions) that we will use in the course. The software is available here:

http://www.logicaldecisionsshop.com/catalog/index.php?main_page=product_info&cPath=2&products_id=21

This software will only run on Windows; however, the College of Engineering offers free virtual machine software that will allow you to run the programs on a Mac. You can find the download here:

<http://it.engineering.iastate.edu/downloads/>

Grading: A weighted average grade will be calculated as follows:

Research Paper Assessments	30%
Individual Project #1	25%
Research Paper Presentation	20%
Individual Project #2	25%

The course grades will be determined as follows:

Score	≥93	87-92	83-86	77-82	76-73	67-72	63-67	60-62	<60
Grade	A	A- or B+	B	B- or C+	C	C- or D+	D	D-	F

If you fall into one of the “gray areas” (A- or B+, B- or C+, C- or D+), your grade will be determined by whether your performance has improved or remained constant (higher grade) or has gotten worse throughout the semester.

Research Paper Assessments: In the first half of the semester, students will read three research papers that describe the application of multi-criteria decision analysis techniques to case study systems. Students will then work in groups to write up assessments of these papers. I will assign the groups, and students will remain in these groups for the duration of the semester.

Research Paper Presentation: In the second half of the semester, each group will read a research paper on decision analysis and will then develop and deliver a presentation on this paper to the class. Grades on this assignment will consist of 1) a team component and 2) an individual component. The individual component will be based on the peer evaluations provided by group members at the end of the semester.

Individual Projects: There are two projects that will be completed by each student individually. Individual Project #1 will involve the application of multi-attribute utility theory to a multi-objective decision problem identified by the student. For Individual Project #2, each student will evaluate a decision problem of their choice using decision trees. Each of these projects will require the submission of a written report that describes the decision analysis and critically evaluates the outputs of the analysis.

General: All work will be submitted electronically through the class website on Blackboard. Up until the submission deadline, assignments may be submitted as many times as you would like. Only the most recent submission will be graded.

Please note that although this class may be offered in a distance education format it is not a self-paced course. All assignments must be submitted on time. Prior arrangements must be made for any scheduling conflicts; work may be submitted early to address schedule issues. Any assignment which is not submitted promptly by its due date and time will be assessed a penalty based on the formula $S = R \times e^{\frac{-t}{171}}$, where S is the score given, R is the score the work would have gotten if turned in on time, and t is the amount of time (in hours or fractions thereof) the work was late. However, **any assignment turned in more than 5 days (120 hours) late will automatically receive a zero.**

Statement on Professionalism: The use of laptops, cell phones, smart phones, or other mobile communication devices is disruptive, and is therefore prohibited during class. Except in emergencies, those using such devices may be asked to leave the classroom for the remainder of the class period.

Statement on Academic Integrity: The IMSE Department has an expectation that all students will be honest in their actions and communications. Individuals suspected of committing academic dishonesty will be directed to the Dean of Students Office as per University policy. For more information regarding Academic Misconduct see:
<http://www.dso.iastate.edu/ja/academic/misconduct.html>

Statement on Disability Accommodations: Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

Lesson Plan (subject to change; in the event of a change, I will notify you in advance):

#	Date	Topics	Reading	Assignment Due
1	1/10	Course Introduction; Why Decision Analysis?	VADM Chapters 1 & 3	
2	1/12	Decision Bias	VADM Chapter 14	
3	1/17	Structuring Multi-Objective Decisions	VADM Chapter 4	
4	1/19	Structuring Multi-Objective Decisions		
5	1/24	Weighting Objectives & Alternatives	VADM Chapter 5	
6	1/26	Weighting Objectives & Alternatives		
7	1/31	Sensitivity Analysis & Value Enhancement	VADM Chapter 6	
8	2/2	Research Paper #1		Assessment #1
9	2/7	Analytical Hierarchy Process	VADM Chapter 7	
10	2/9	AHP		
11	2/14	Quality Function Deployment		
12	2/16	QFD		
13	2/21	Research Paper #2		Assessment #2
14	2/23	Risk Management	VADM Chapter 8	
15	2/28	Forecast Bias	VADM Chapter 13	
16	3/2	Monte Carlo Simulation	VADM Chapter 9	
17	3/7	Decision Trees	VADM Chapter 10	
18	3/9	Research Paper #3		Assessment #3
	3/14	Spring Break (no lecture)		
	3/16	Spring Break (no lecture)		
19	3/21	Decision Trees		Individual Project #1
20	3/23	The Value of Information & Delay	VADM Chapter 11	
21	3/28	The Value of Information & Delay		
22	3/30	Risk Attitude & Utility Theory	VADM Chapter 12	
23	4/4	Risk Attitude & Utility Theory		
24	4/6			
25	4/11	Bounded Rationality & Heuristics		
26	4/13	Ethical Decisions	VADM Chapter 16	
27	4/18	Research Paper Presentations		
28	4/20	Research Paper Presentations		
29	4/25	TBD		
30	4/27	Research Paper Presentations		Individual Project #2
	5/4	Research Paper Presentations: 7:30 a.m.-9:30 a.m.		