Decision Making Under Uncertainty

Systems and Industrial Engineering
University of Arizona

Instructor
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Catalog Description

Application of principles of probability and statistics to the design and control of engineering systems in a random or uncertain environment.

Prerequisites: Introduction to Probability and Statistics

Text Book: Clemen and Reilly, *Making Hard Decisions,* South-Western Cengage Learning, 3rd edition.
ISBN: 0-538-79757-6

Software: Decision Tool Suite (Student Edition), download from:

http://www.palisade.com/academic/students.asp
(or use Pro-Version remotely from campus computers)

Course objectives

- Develop the skills to identify, define, scope, model, and analyze complex decision problems
- Identify sources of variability, and address variability in decision making, including sensitivity analysis
- Include pertinent information and decision maker preferences in decision-making and incorporate these elements in decision analyses
- Develop ability to effectively communicate decision recommendations, including analysis

Evaluation:
This class will follow an interactive, collaborative learning format, thus participation is expected and required for success.

1. Videos from University of Arizona professor are available on-line and should be viewed by students prior to class
2. Class discussions opportunities about text and video content will be provided throughout the course.

3. Assignments applying class principles will be started during class time under the supervision of the on-site instructor. Any assignments not completed in class can be completed outside of class and submitted through the Desire to Learn (D2L) website.
    a. Timeliness: In real-world situations a partial answer on time is more valuable than a 100% correct answer that arrives late. If you cannot turn work in on time, you must negotiate an extension with the instructor prior to the due date.
    b. Academic integrity: I expect each of you to uphold the University of Arizona academic integrity policy.
    c. Quality: In submitted work pay attention to detail and logic in written assignments. Make sure that you label and title plots appropriately.

Project. This course will include a final project, to be defined, that each individual student must complete.

Exams. This course includes two exams. Resources allowed will be clearly specified at the time of the exam.

Grading:

Assignments (Reading Checks, Discussion, Collab)	20%
Exam1	20%
Exam2	20%
Project	20%
Final	20%

D2L Website**:**

You will access this site by going to http://d2l.arizona.edu and logging in with your UA Net ID. If you need assistance with D2L you should contact D2L Help (http://help.d2l.arizona.edu); you may also try the 24/7 IT Support center on campus (http://the247.arizona.edu), which is available 24 hours a day, 7 days a week. When you log on to D2L, this course will be listed on the welcome page under "My Courses".

Announcements, class notes, PowerPoint files, spreadsheets used in class, assignments and solutions, discussion questions, and links to news items of interest will be posted to this website. You must be registered for the class to be permitted entry to the site.

General Policies:

- Special Needs and Accommodations: Let me know immediately if you have any special needs which require accommodation. Students needing special accommodations should contact SALT, 1010 N Highland Ave., or the Center for Disability Related Resources, 1224 E. Lowell Street, for documentation of special needs.

- Inclusive Excellence is a fundamental part of the University of Arizona's strategic plan and culture. As a part of this initiative, the institution embraces and practices diversity and inclusiveness. These values are expected, respected and welcomed in this course.

Lecture 1 (Ch 1)	**Lecture 2 (Ch 2)**	**Lecture 3 (Ch 3)**
Course Overview	4 Elements of Decisions & Time Value of Money	Structuring Objectives
Lecture 4 (Ch 4)	**Lecture 5**	**Lecture 6**
Structuring Decisions Using Influence Diagrams	Structuring Decisions Using Decision Trees	Understanding Risk
Lecture 7	**Lecture 8 (Ch 5)**	**Lecture 9**
Making Decisions with Multiple Objects	One Way Sensitivity Analysis	Two Way Sensitivity Analysis
Lecture 10 (Ch 6)	**Lecture 11**	**Lecture 12**
Corporate Decision Making	Guest Speaker	Review for Exam1
Lecture 13	**Lecture 14 (Ch 7)**	**Lecture 15**
Release Term Project	Axioms of Probability	Condition Probability & Independence
Lecture 16	**Lecture 17**	**Lecture 18**
Law of Total Probability & Bayes Theorem	Expected Value & Sample Statistics	Covariance & Correlation
Lecture 19 (Ch 8)	**Lecture 20 (Ch 9)**	**Lecture 21**
Subjective Probability	Discrete Probability Distribution Functions	Continuous Probability Distribution Functions
Lecture 22	**Lecture 23 (Ch10)**	**Lecture 24**
Normal/Gaussian Probability Distribution Function	Using Data to Build a Cumulative Distribution	Linear Regression Analysis
Lecture 25	**Lecture 26**	**Lecture 27 (Ch 11)**
Example Model Using Data	Review for Exam2	Simulation Overview
Lecture 28	**Lecture 29**	**Lecture 30**
Optimization Using Simulation	Simulation versus Sensitivity Analysis	Simulation Case Study
Lecture 31 (Ch 12)	**Lecture 32**	**Lecture 33**
Value of Information	Expected Value of Perfect Information	Expected Value of Imperfect Information
Lecture 34 (Ch 13)	**Lecture 35**	**Lecture 36**
Introduction to Options	Valuing Financial Options	Valuing Real Options
Lecture 37 (Ch 14)	**Lecture 38**	**Lecture 39**
Value of Information	Expected Value of Perfect Information	Expected Value of Imperfect Information (EVII)
Lecture 40	**Special Topic 1**	**Special Topic 2**
Review for Final	Class Project Presentations	Class Project Presentations
Class Project Presentations		
Final Exam		