Decision Making Under Uncertainty

SIE 422/522 – Fall 2017

Harvill 204 - MWF, 2:00-2:50pm

Instructor
Dr. Donald Bruyere
Office phone: 621-2298
dbruyere@email.arizona.edu
Office: ENGR 154
Office hours: Monday and Wednesday 3:15 - 4:45 in ENGR 258 or by appointment in office.

Grader
Javier T. Salido
Office: AME N-414
Email: jtsalido@email.arizona.edu

Catalog Description

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

Prerequisites: SIE305, SIE 330R

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

Software: Decision Tool Suite (Student Edition), available on ENGR 127, 129 computers or download from:

http://www.palisade.com/academic/students.asp

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, seminar-style format, thus participation is expected and required for success.

1. Class discussions are encouraged throughout the course. Off-campus students are encouraged to e-mail questions and comments they have while viewing the recorded sessions, and the instructor will share as he sees appropriate.

2. Homework is assigned bi-weekly.
   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. Unless otherwise specified work may be submitted up to 24 hours late for 75% credit; after 24 hours work will not be accepted.

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.

d. Submittal – unless otherwise stated, homework will be submitted via D2L dropbox in a single .PDF file using the following naming convention:

StudentLastName_StudentFirstName_SIE422_Fall_2016_HW#.PDF (for 422 students)
StudentLastName_StudentFirstName_SIE522_Fall_2016_HW#.PDF (for 522 students)

3. **Project.** This course will include a final project. Although all students may be working on the same problem for the project, a different project scope and level of effort will be defined for 422 (undergraduate) students than those for the 522 (graduate) level students to help challenge the graduate students more appropriately.

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

Grading:

Homework	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, homework assignments and solutions, discussion questions, and links to news items of interest will posted to this website. You must be registered for the class to be permitted entry to the site.

General Policies:

- H/W and Exam: We will do our best to ensure fairness and consistency in our homework and exam grading policies. If you feel that your work has not been graded fairly, please contact me within a week of the date in which the test was returned. However, this does open the possibility of having the entire homework or exam re-graded, which may or may not be in your favor.

- 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.

Monday	Wednesday	Friday
8/21	**8/23**	**8/25**
Review Syllabus	Overview of Decision Analysis	Elements of Decision Making
8/28	**8/30**	**9/1**
Uncertainty, consequences and the time value money	Structuring Decisions: Values and Objectives	Identifying Objectives
9/4	**9/6**	**9/8**
NO CLASS – Labor Day	Influence Diagrams	Decision Trees
9/11	**9/13**	**9/15**
Stochastic Dominance	Tornado Diagrams	One Way Sensitivity Analysis
9/18	**9/20**	**9/22**
Two Way Sensitivity Analysis	Presentation on Chevron Decision	Corporate Decision Making
9/25	**9/27**	**9/29**
Review	Exam 1	No Class
10/2	**10/4**	**10/6**
Probability (Release Term Project)	Total Probability and Bayes Theorem	Bayesian Decision Making
10/9	**10/11**	**10/13**
Expected Value	Subjective Probability	Discrete Distributions Binomial & Poisson
10/16	**10/18**	**10/20**
Continuous Distributions Normal/Exponential	Continuous Distribution Triangle/Beta	Building Distributions from Data
10/23	**10/25**	**10/27**
Covariance	Correlation	Linear Regressions
10/30	**11/1**	**11/3**
Curve Fitting Distributions	Incorporation of Theoretical Models into Monte Carlo	Simulation vs. Decision Trees
11/6	**11/8**	**11/10**
Review	Exam 2	Veterans Day
11/13	**11/15**	**11/17**
Using @RISK	Value of Information	Expected Value of Perfect Information
11/20	**11/22**	**11/24**
Expected Value of Imperfect Information (EVII)	Real Options	Thanksgiving Holiday
11/27	**11/29**	**12/1**
Understanding Risk & Risk Attitudes	Presentations	Presentations
12/4	**12/6**	**12/8**
Presentations	Presentations	No Class
Final – Wednesday, December 13th, at 1:00 to 3:00		