

TED UNIVERSITY

IE 451 Decision and Risk Analysis

Fall 2016-2017

Credit Hours: (3+0+0) 3 TEDU Credits, 5 ECTS Credits

Instructor:

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Lectures: 14:00-16:00 Monday (A116)

16:00-17:00 Tuesday (A116)

Office Hours: By appointment

Course Description: Modeling of the decision problem: Structuring decisions, influence diagrams, decision trees, risk profiles, sensitivity analysis. Modeling uncertainty: Probability concepts, value of information, Monte Carlo simulation. Modeling preferences: Risk, utility theory, prospect theory.

Pre-requisites: MATH 230

Learning Outcomes:

Upon successful completion of this course, a student will be able to

1. Identify elements of decision making, structure and model complex decision problems. (B1,e)
2. Apply appropriate techniques and methods to solve decision analysis problems (B3,k)
3. Assess the value of information (B6,k)
4. Model risk attitudes of decision makers. (B5, k)

Grading:

Assignments (3)	15%
Midterm	25%
Final Exam	30%
Active Learning Exercises	10%
Project	20%

Required Textbook:

- Lecture notes

Recommended Textbooks:

- Clemen, R. T. , Reilly, T. (2014), Making Hard Decisions with Decision Tools, CENGAGE Learning.
- Herrmann, J.W. (2014) Engineering Decision Making and Risk Management, Wiley.
- Winston, W.L. (2004) Operations Research, CENGAGE Learning.

- Raiffa H. (1997), Decision Analysis: Introductory Lectures on Choices Under Uncertainty, McGraw-Hill.

Software: Palisade Decision Tools (Precision Tree, @RISK)

Important Dates:

- Midterm – November 24, 2016
- Project Proposal Submission – November 24, 2016
- Project Report Submission – Finals Week (To be dated)
- Final Exam – Finals Week (To be dated)

Tentative Course Schedule

Week	Topic
1	Introduction to Decision Analysis, Elements of Decision Making, Influence Diagrams
2	Influence Diagrams, Decision Trees
3	Risk Profiles and Attitudes, Dominance
4	Sensitivity Analysis
5	Modeling Uncertainty: Probability review, Bayes' Theorem
6	Value of Information
7	Using Software (Precision Tree, @RISK)
8	Cognitive Biases, Decision Making Heuristics
9	Midterm
10	Subjective Probability
11	Monte Carlo Simulation
12	Risk and Utility Theory
13	Utility Theory
14	Utility Theory

Term Project

The project can be done as a part of at most 2-person group. The project should address a real life decision with either a personal or business focus. It will work best if a friend or colleague is (was) facing the decision. You may select a decision that was made in the past and perform a retrospective analysis; this approach is difficult because there is a lot of research that must be done to capture the situation realistically. Students shall submit a statement about their group members for the project by November 25, 2016. An abstract of the decision that is the focus of the project (i.e. project proposal) shall be submitted by this date as well. The proposal should contain a summary of the decision and lists of tentative objectives and alternatives. Final report is due Finals Week (to be dated).

Project Requirements for Decision/Risk Analysis

1. Provide a summary of the decision problem (who is the decision-maker, what is the decision time frame).
2. Define the objectives hierarchy and utility functions (what are the objectives and why are they objectives, what is the utility function for each bottom level objective and what were the assessment queries used to define these functions, what are the weights for the objectives hierarchy and what were the assessment queries used to define these weights).
3. Define the alternatives.
4. Define any uncertainties included in the analysis (define the variables, the uncertain states, the conditioning variables, and the probability distributions).
5. Summarize the results of the analysis. Use decision trees.
6. Describe the analysis computations.
7. Provide sensitivity analyses for parameters that might change the recommended decision.

General Policy

Syllabus Change: The course schedule announced is tentative. It will be adapted to the pace of class in agreement with the students.

Make up policy: Make up exams will be given only for medical excuses documented by medical reports that are approved by the Student Health Center or other documented excuses approved by the university's executive branches. There will only be one comprehensive make up exam.

Assignment submission policy:

- Assignment solutions must be handed in at the beginning of class on the day that it is due.
- Late submissions are not accepted.
- Your solutions must be written neatly and in an understandable fashion.
- Under no circumstances it is allowed to copy another student's work. Otherwise, the student(s) involved will receive 0 for that assignment.

Academic Integrity: Students are expected to honor the academic integrity principles according to the TEDU rules and procedures. Non-compliance to academic integrity principles through plagiarism, using or accomplishing another person's work, and/or submitting previously used work will be penalized severely.