

# ÇANKAYA UNIVERSITY

Faculty of Engineering

**IE512 Decision Analysis Syllabus** 

# **Course Name**

English DECISION ANALYSIS Name

Turkish Name KARAR ANALİZİ

# **Course Description**

This course is designed to cover quantitative decision analysis. The course is mainly divided into three parts, a review and general introduction to decision analysis, decision tree analysis with a single and multiple objectives and corresponding risk profiles; and introduction to utility theory including sensitivity analysis. In the first part, general introduction to decision analysis, structuring and developing a decision model; decision situations, screening alternatives and decision-making traps are covered. The merits of a structured rational decision-making process are emphasized. In the second part, the structuring of decision elements (values, objectives, alternatives, measures, tradeoffs, and uncertainty), expected value analysis; decision tree analysis with a single objective and corresponding risk profiles are covered. Multi-attribute utility theory (MAUT) and analytic hierarchy process (AHP) for decision under certainty, and decision trees for decisions under uncertainty are introduced. Finally, in the third part, probabilistic and non-probabilistic criteria for decision making under uncertainty; value of information; introduction to utility theory; sensitivity analysis. are discussed. Value-added risk management is also covered.

# **Course Objectives**

This course aims to introduce decision-analysis problems and techniques to resolve decision analysis situations with an overview of sample real life problems.

The main aims of this course are:

• to help students recognize types of problems that can be addressed using decision analysis and differentiate between risk and uncertainty,

• to develop skills in identifying decision elements,

• to introduce graphical and mathematical approaches for structuring and solving decision problems,

• to develop skills in applying decision analysis concepts and techniques to identify good decisions and strategies,

• to introduce sensitivity analysis tools that will help identify importance of parameters on the results of a decision analysis.

#### **Learning Outcomes**

On successful completion of the course, all students will have developed:

- 1. skills in identifying decision elements, building and solving a decision model,
- 2. skills in identifying and dealing with uncertainty and risk in decision making.

On successful completion of the course, all students will be:

- 3. involved in teamwork,
- 4. aware of ethical issues.

#### **Teaching Policy**

Each week, 3 hours of lecturing.

#### **Computer Usage**

Spreadsheet software available at the university may be used.

### Textbook(s)

Robert T. Clemen and	Making Hard Decisions with DecisionTools	; (	Cengage Learı	ning		
Terence Reilly 201	4 ISBN 978-0538797573					
Reference Books						
Winston, Wayne L. 978-0534380588	Operations Research: Applications and Algorith	าฑร	Cengage Lea	rning	2003	ISBN
Golub, Andrew Lang	Decision Analysis: An Integrated Approach	Wiley	1997 ISB	SN 978-0	471155	119

# **Course Outline**

Week Topic(s)

1 Variety of decision-making situations. General introduction to decision analysis, structuring and developing a decision model; decision situations, screening alternatives and decision-making traps

- 2 Background and formal definitions of decision making. the structuring of decision elements (values, objectives, alternatives, measures, tradeoffs, and uncertainty).
- 3 Multiple and contradicting objectives. Decision trees. Overview of problems under certainty and uncertainty.
- 4 Defining objectives and sub-objectives. Comprehensive and measurable attributes. Domination and efficient frontier solutions.
- 5 Expected value analysis; decision tree analysis with a single objective and corresponding risk profiles
- 6 Multi-attribute utility theory (MAUT) and analytic hierarchy process (AHP) for decision under certainty, and decision trees for decisions under uncertainty
- 7 Probabilistic and non-probabilistic criteria for decision making under uncertainty; value of information; introduction to utility theory; sensitivity analysis
- 8 Problems under uncertainty. The Expected Monetary Value approach to multiple objective decision making. Utility Theory. Utility functions for single-attribute problems. Assessment of utility functions. Risk aversion.
- 9 Problems under uncertainty and the Utility Theory. Utility functions for single-attribute problems. Assessment of utility functions. Risk aversion.
- 10 Utility functions for single-attribute problems. Assessment of utility functions. Risk aversion.
- 11 Multi-attribute problems under uncertainty and utility independence.
- 12 Value-added risk management
- 13 Overview of applications of decision making.
- 14 Advanced topics in decision making.

### **Lecture Hours**

Section 1: Wednesday 09:20—12:00 (Merkez Kampüs LB05)

### Grading

Midterm-1 30%

Complementary Project 25%

Final Exam 45%

### Lecturer

Birce Boğa, Ph.D in Industrial Engineering

birceboga@cankaya.edu.tr

Office hour: TBA

#### **IMPORTANT NOTES**

• Spreadsheet and some decision analysis software (e.g., Palisade Decision Tool Suite student trial version) may be used in class, assignments

• Communication will be made through http://webonline.cankaya.edu.tr Announcements should be checked regularly. Students should check their accounts to make sure that they can access the page of IE 435 through web online,

• Every student should study regularly from the textbooks.

• Regular attendance for lectures as well as recitation hours is expected. It is the responsibility of the students to avoid timetable clashes during registrations.

• Any student who has not attended at least 20% of the lectures will not be admitted to the Final exam.

• Make-up exams for the Midterms are given only for students who have medical reports given (or approved) by Çankaya University Health Center. All medical excuse reports should be officially submitted within 7 working days (starting from the end date of the medical excuse). Make-up exams will not be given for applications which are not submitted on time.

• There are no make-ups for missing complementary projects or homework.

• It is expected that interactive learning and teaching will enrich the learning experience of all students, and that each student will work in partnership with the Learning Facilitator to create a positive learning experience for all. Student engagement is a necessary condition for an effective learning experience, and includes contributions to debate and discussion, positive interactive learning with others, and an enthusiastic attitude towards inquiry.

• Everyone is expected to be a positive contributor to the class learning community, and students

are expected to share the responsibility of teaching each other.

Additional sources:

https://www.brighttalk.com/webcast/18521/551816?utm\_source=brighttalksharing&utm\_medium=web&utm\_campaign=linkshare

#### **Reference Books:**

Decision Analysis, Raiffa H., Addison-Wesley, 1968.
Decision Analysis for Management Judgement, Goodwin P. and Wright G., Wiley, 1999 (HD 30.23 G66).
Decision Making Under Uncertainty, Holloway, C. A., Prentice-Hall, 1979.
Decisions with Multiple Objectives, Keeney, R.L. and Raiffa, H., Wiley, 1976 (T57.95K44 1993).
An Introduction to Bayesian Inference and Decision, Winkler R. L., Probabilistic Publishing, 2003 (QA279.5W56 2003 C.2).

#### **Executive Summary**

What is an Executive Summary? How to develop an Executive Summary?

Executive Summaries are much like any other summary in that their main goal is to provide a condensed version of the content of a longer report.

The executive summary is usually no longer than 10% of the original document. It can be anywhere from 1-10 pages long, depending on the report's length. Executive summaries are written literally for an executive who most likely DOES NOT have the time to read the original [document].

Executive summaries make a recommendation. Accuracy is essential because decisions will be made based on your summary by people who have not read the original.

Executive summaries frequently summarize more than one document"

In addition, please find the following Good and poor examples of executive summaries at

http://unilearning.uow.edu.au/report/4bi1.html.

Finally, please find a more comprehensive definition and know how about Executive Summaries at the:

University Writing Center at Texas A&M

http://writingcenter.tamu.edu/2008/types-communication/business-professional-

writing/executive-summary/

# Classroom Policy:

Every student is expected to respect the other students' right to learn. Any behavior which distracts or disturbs the other students or the instructor, or disrupts class in any way is unacceptable and will not be tolerated.

# Make-up Policy:

A make-up examination for the midterm and the final exam will only be given under highly unusual circumstances (such as serious health or family problems). The student should contact the instructor as early as possible and provide the instructor with proper documentation (such as a medical note certified by Çankaya University's Health Center). A make-up exam may have a different format and may contain different type of questions than the regular exam.

# Attendance:

Attendance will be taken every lecture hour. It is strongly recommended to attend all the lecture hours to understand the course material.

#### Conditions that lead to the letter grade "NA":

Not attending the Midterm Exam (or its makeup) or the Final Exam (or its makeup).