

Course number and name	END 327 / Decision Theory
Credits, contact hours, categorization of credits	3 credits / 42 hours / Engineering topic
Instructor or course coordinator	Burhaneddin SANDIKÇI
Text book and other supplemental materials	<ul style="list-style-type: none"> • R.A. Howard, A.E Abbas. <i>Foundations of Decision Analysis</i> (2016), Pearson. ISBN: 1-292-07969-X • R.T. Clemen, T. Reilly. <i>Making Hard Decisions with DecisionTools</i>, 3rd edition (2014). Duxbury. ISBN: 0-538-79757-6 • H. Raiffa. <i>Decision Analysis: Introductory Lectures on Choices under Uncertainty</i> (1968). Addison-Wesley. ISBN: 0-070-52579-X

Course information	
Content	Basic concepts of decision theory, modeling and solution methods of decision making problems with applications, decision making methodology.
Prerequisites	END 252 Theory of Probability, END 331 Operations Research I
Type	Selected elective

Course learning outcomes
<p>Students who pass the course will:</p> <ol style="list-style-type: none"> I. Learn the basic terms and concepts of decision theory II. Learn how to structure, model, and classify decision making problems III. Learn how to apply various decision making criteria including maximin, maximax, minimax regret, Hurwicz, Laplace, expected payoff, expected opportunity loss IV. Learn how to deal with uncertainty and risk in decision making V. Learn how to deal with sequential (multi-stage) decision problems VI. Learn how to conduct Bayesian decision making and to build and analyze decision trees VII. Learn how to calculate the value of information VIII. Learn how to apply utility theory IX. Learn about multiobjective decision making and goal programming models X. Learn about multi-criteria decision making applications XI. Learn how to apply the analytical hierarchy process and ELECTRE methods

Student outcomes	Level of contribution
SO1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	Partial
SO2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Little
SO3. An ability to communicate effectively with a range of audiences.	Not applicable
SO4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Partial
SO5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	High
SO6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	High
SO7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Partial

Week	Topics	Learning outcome(s)
1	Basic concepts and definitions in decision theory	I
2	Modeling and structuring decision making problems	II
3	Decision making under uncertainty	III-IV
4	Decision making under uncertainty (cont'd)	III-IV
5	Multi-stage decision problems and decision tree models	V-VI
6	Bayesian decision making, the value of information	V-VII
7	Utility theory	VIII
8	Utility theory (cont'd)	VIII
9	Problems and cases from practice for Bayesian decision making, decision trees, value of information, utility theory	V-VIII
10	Multiobjective decision making and goal programming	IX
11	Multi-criteria decision making: Basic concepts and applications	X
12	Analytical hierarchy process	XI
13	ELECTRE	XI
14	Examples and case studies	I-XI