Course number and name	END 472 / Advanced Spreadsheet Modeling
Credits, contact hours, categorization of credits	3 credits / 42 hours / Engineering topic
Instructor or course coordinator	Murat DURUCU
Text book and other supplemental materials	• Cliff Ragsdale, 2014, *Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics* 7th Edition, South-Western College Pub; 7 edition (January 1, 2014) • S. Christian Albright, Wayne Winston, 2004, *Spreadsheet Modeling and Applications: Essentials of Practical Management Science* (with CD-ROM and InfoTrac) 1st Edition, South-Western College Pub; 1 edition (April 21, 2004).

Course information	
Content	The goal of this course using quantitative tools like solver within the spreadsheets and modeling the cases. Building on their brief introduction in the Operation Research core course, students use these advanced tools to analyze problems and cases in finance, marketing, and operations. Although the bulk of this course is devoted to case analysis, occasional lectures introduce some advanced features of these two powerful modeling tools, including integer and nonlinear programming and sensitivity analysis within optimization, and correlated random variables, scenario analysis, and valid statistical analysis within simulation.
Prerequisites	None
Type	Selected elective

Course learning outcomes
Students who pass the course will be able:
I. Spreadsheet functions, skills and financial models
II. Deterministic and stochastic optimization techniques to determine the best managerial actions under internally-and/or externally-imposed constraints
III. Probability distribution fitting techniques to find the most likely description of the uncertainty in future business
IV. Simulation modeling techniques to discover and analyze the risk and uncertainties in business environment and processes
V. Application of spreadsheet modeling and simulation techniques in forecasting

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.	Little
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.	Little
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.	Little
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	Introduction to modelling and decision analysis with spreadsheets	I
2	Introduction to optimization and linear programming with spreadsheets	I
3	Modeling and solving LP problems in spreadsheet with spreadsheets	I, II
4	Sensitivity analysis and the simplex method with spreadsheets	II, III
5	Network modelling with spreadsheets	III
6	Integer linear programming with spreadsheets	II, III
7	Goal programming and multiple objective optimizations with spreadsheets	III, IV
8	Nonlinear programing with spreadsheets	II, III
9	Regression analysis with spreadsheets	II, III
10	Data mining with spreadsheets	III, IV
11	Time series and forecasting with spreadsheets	IV, V
12	Introduction to simulation using analytic solver platform with spreadsheets	II, V
13	Queuing theory with spreadsheets	II, IV, V
14	Decision analysis and project management with spreadsheets	III, V