Course number and name	END 215 / System Thinking & Analysis
Credits, contact hours, categorization of credits	2 credits / 28 hours / Engineering topic
Instructor or course coordinator	Erhan BOZDAĞ / Çiğdem KADAİFÇİ YANMAZ
Text book and other supplemental materials	• Daellenbach, H.G. and McNickle, D.C. (2005). *Management Science: Decision Making through System Thinking*. Palgrave Macmillan, New York. • Jackson, M.C. (2003). *Systems Thinking: Creative Holism for Managers*. John Wiley & Sons, London. • Erkut, H. (2000). *Analiz, Tasarım ve Uygulamalı Sistem Yönetimi*. İkinci Baskı. İrfan Yayıncılık, İstanbul. • Checkland, P. (2000). Soft Systems Methodology: A Thirty Year Retrospective. *Systems Research and Behavioral Science*, 17(1), 11-58.

Course information	
Content	This course examines system definition, hierarchy of systems, principles of systems approach, system concepts, system as a black box, system analysis, system design, implementation, operation, soft systems methodology and stages, system thinking, feedback loops, behaviors of systems.
Prerequisites	None
Type	Required

Course learning outcomes
I. Analyzing the organizations with system approach using system concepts II. Defining the relevant problems and analyzing the system accordingly III. Developing solution proposals to eliminate or mitigate the problems IV. Building models and designing a new system V. Carrying out the preparation and implementation phases of the designed system

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.	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.	Partial
SO6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	Not applicable
SO7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Not applicable

Week	Topics	Learning outcome(s)
1	Basic Concepts, System Definitions	I
2	System Concepts: Classification of Systems, Systems Hierarchy, Weltanschauung, Subjectivity in System Definition	I
3	System Concepts: System Components, System as a Black Box, Inputs, Outputs, Transformation, Environment	I
4	Model and Modelling	I
5	System Analysis: Formulation of the Problem, Definition of System and Wider System, Objectives of System and Wider System	II
6	System Design: Forecasting, Model Building, Optimization, Control	II, III
7	System Preparation and Implementation: Documentation, System Building, Initial Operation, Retrospective Approach, Improved Operation	IV
8	Applications of System Analysis and Design	I, IV
9	Soft Systems Methodologies: Stage 1-2	II
10	Soft Systems Methodologies: Stage 3-4	III
11	Soft Systems Methodologies: Stage 5-7	IV, V
12	System Thinking: Causa-effect Analysis, Influence Diagrams, The Concept of Feedback, Positive and Negative Feedback	I, II
13	System Thinking: Fundamental System Behaviors	I, II
14	System Thinking: Examples and Review	I, V