Course number and name	END 439 / Neural Network Models in Industrial Systems
Credits, contact hours, categorization of credits	3 credits / 42 hours / Engineering topic
Instructor or course coordinator	Ömer Faruk BEYCA, Kutay TİNÇ
Text book and other supplemental materials	• Lewis, N.D. (2016), *Deep Time Series Forecasting with Python.* • Pal, A. & Prakash, P. (2017), *Practical Time Series Analysis*, Peckt Publishing. • Nielsen M. (2017), *Neural Networks and Deep Learning*, E-book.

Course information	
Content	Application of artificial neural networks in fields of Industrial Engineering and data acquisition, data cleaning and data analysis examples.
Prerequisites	END 332 Operation Research II and (MAT 201 Differential Equations or MAT 210 Engineering Mathematics or END 210 Linear Algebra for Industrial Engineers)
Type	Selected elective

Course learning outcomes

Students who pass the course will be able to:

I. Be aware of the place of artificial intelligence in our lives.
II. Gain the ability to transform data into understandable output using artificial intelligence.
III. Recognize artificial neural networks and activation functions.
IV. Learn to improve artificial intelligence systems.

Student outcomes	Level of contribution
SO1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	High
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.	High
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.	High
SO7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	High

Week	Topics	Learning outcome(s)
1	Data Structure	I
2	Time Series Analysis Techniques	I
3	Introduction to artificial intelligence	I
4	Perceptrons (Single/Multi Layer)	III
5	Artificial Neural Networks – Activation Functions	III
6	Artificial Neural Networks – Deep Learning	III
7	Learning Techniques	II-III
8	Backpropagation Algorithm	II-III
9	Backpropagation Application	II-III
10	Simple Recurrent Neural Networks Theory	II-IV
11	RNN Application	II-IV
12	Convolutional Neural Networks	II-IV
13	CNN Application	II-IV
14	Reinforcement Learning	II-IV