

0205718 ARTIFICAL NEURAL NETWORK

Normal Education:

Evening Education:

Fall 2018-2019

**Course Format:** face-to-face

**INSTRUCTOR INFORMATION**

**Instructor:**

**Title:**

**Office:**

**Phone:**

**Office Hours:**

**E-mail:**

**COURSE DESCRIPTION**

**Credits :***4 Credits (3+1)*

**ECTS**: *6*

**Required or elective :** *Elective for Computer Engineering Students*

**Catalog Description:** *This course covers artificial neural networks and machine learning, including activation functions, feed-forward and feed-back network structures, approximation of nonlinear functions, supervised and unsupervised machine learning algorithms, recurrent networks, weighted networks, perceptron learning algorithms, Dynamic Programming and their applications in various engineering problems..*

**Prerequisites:** *None*

**Textbook(s) and/or required materials:**

*Haykin, Neural Networks and Learning Machines, Pearson Education, 3rd Ed., 2009, ISBN13 9780131293762.*

*Ercan Öztemel, Yapay Sinir Ağları, Papatya Yayıncılık,, 2012, ISBN: 978-975-6797-39-6.*

**Course Objectives**

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| ***The objectives of this course are to:*** | |
| *1* | *To teach the basics about artificial neural networks* |
| *2* | *To teach the structures of artifical neural networks* |
| *3* | *To teach the subjects that should be taken into consideration in the design of artificial neural networks* |
| *4* | *To solve the nonlineer engineering problems using artificial neural network.* |

**Course Topics**

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| ***No*** |  |
| *1* | *Information on brain, biological neuron and nervous system.* |
| *2* | *Artificial neural Networks idea, basic concepts, machine learning paradigms, Hebb rule and ANN advantages* |
| *3* | *Single layer artificial neural networks and ADALINE neural network model* |
| *4* | *Gradient Descent algorithm for output minimization with supervised learining rule and least mean square rule* |
| *5* | *Training process of the feed forward multilayer perceptrons neural network* |
| *6* | *Training process of the multilayer neural networks with back propagation.* |
| *7* | *Reinforcement learning-LVQ neural model and training this networks* |
| *8* | *Midterm Exam* |
| *9* | *Unsupervised learing- Apative resonance theory network* |
| *10* | *Recurrent neural networks* |
| *11* | *Elman and Kohonen Networks* |
| *12* | *Radial basis neural networks* |
| *13* | *Adaptive neuro-fuzzy inference systems* |
| *14* | *Hibrid neural networks* |

**Course Learning Outcomes**

*At the end of this course, students will be able to;*

* *Learn how artificial neural networks work by understanding the structure of biological neurons and nervous systems.*
* *Understand the learning and training mechanism of artificial neural networks by the mathmetical model of the system.*
* *Decide whether to use artificial neural network model with supervised or unsupervised leraning according to the problem type.*
* *See what the results will be in the case of changes in system parameters that are used in training process of artificial neural networks.*
* *Determine the difference of adaptive neuro fuzzy incerence systems and classical neural networks such as back propagation ANN.*
* *Learn the structure of hybrid neural networks with metaheuristic methods for ANN system optimization*
* *Solve a nonlineer problem using the learning ability of the ANN.*
* *Perform the training process programatically understanding how machine learning is.*

**Evaluation methods**

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| *1. Midterm Exam* | *40%* |
| *2. Final Exam* | *60%* |

***Professional component***

|  |  |
| --- | --- |
| *Engineering topics* | *100%* |
| *General education* | *0%* |
| *Mathematics and basic sciences* | *0%* |

**Person(s) who prepared this description and date of preparation**

*Muhammet Nuri Seyman, June, 2018*

**Date of last revision**

*June 2018*