

Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
IND 561	Artificial Neural Networks	2	3	0	0	3	6

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Elective
Course Level	Masters Degree
Objective	The aim of this course is to introduce artificial neural networks and discuss the basic ideas behind machine learning; present the concept of perceptron as a simple computing element and consider the perceptron learning rule; to introduce recurrent neural networks; explore Hebbian and competitive learning. Moreover, hybrid intelligent systems as a combination of different intelligent technologies will be introduced and evolutionary neural networks and fuzzy evolutionary systems will be discussed.
Content	<ol style="list-style-type: none">1. week : Introduction to knowledge-base intelligent systems2. week : Rule-based expert systems3. week : Uncertainty management in rule-based expert systems4. week : Fuzzy expert systems: Fuzzy logic5. week : Frame-based expert systems6. week : Artificial neural networks: Supervised learning7. week : Artificial neural networks: Unsupervised learning8. week : Evolutionary Computation: Genetic algorithms9. week : Mid term10. week : Evolutionary Computation: Evolution strategies and genetic programming11. week : Hybrid intelligent systems: Neural expert systems and neuro-fuzzy systems12. week : Hybrid intelligent systems: Evolutionary neural networks and fuzzy evolutionary systems13. week : Knowledge engineering: Building neural network based systems14. week : Data mining and knowledge discovery
References	Negnevitsky, M., Artificial Intelligence: A Guide to Intelligent Systems, Second Edition, Addison Wesley, 2004.

Theory Topics

Week	Weekly Contents
1	Introduction, Artificial Intelligence, Machine Learning
2	Linear Algebra Review
3	Linear regression with one variable and with multiple variables
4	Logistic regression with one variable and with multiple variables
5	Regularization
6	Neuron models and basic learning rules
7	Multi-layer perceptron
8	Midterm Examination
9	Different architectures
10	Associative memory and Hopfield Neural Network
11	Distance Based Neural Networks I
12	Distance Based Neural Networks II
13	Neural Network Trees
14	Clustering