

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	<p>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.</p>						
Content	1. week : Introduction to knowledge-base intelligent systems						
	2. week : Rule-based expert systems						
	3. week : Uncertainty management in rule-based expert systems						
	4. week : Fuzzy expert systems: Fuzzy logic						
	5. week : Frame-based expert systems						
	6. week : Artificial neural networks: Supervised learning						
	7. week : Artificial neural networks: Unsupervised learning						
	8. week : Evolutionary Computation: Genetic algorithms						
	9. week : Mid term						
	10. week : Evolutionary Computation: Evolution strategies and genetic programming						
	11. week : Hybrid intelligent systems: Neural expert systems and neuro-fuzzy systems						
	12. week : Hybrid intelligent systems: Evolutionary neural networks and fuzzy evolutionary systems						
	13. week : Knowledge engineering: Building neural network based systems						
	14. 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