

D – Description of Course				
Course	Neural networks and Applications II			
Type			Recommended year/term	5/W
Time extent	2+0	credits	3	Completion examination
Form			Code	
Teacher	Ing. F. Hakl, CSc., doc. Ing. RNDr. M. Holeňa, Csc.			
Goals				
Acquired knowledge: The theoretical foundation for the study of the properties and potential of artificial neural networks models.				
Acquired skills: Advanced ability to analyze the appropriateness and effectiveness of artificial neural networks models for practical applications. The fundamental basis for the expansion of theoretical knowledge enabling greater understanding and development of artificial intelligence.				
Outline				
The lecture is devoted to the advanced theoretical foundations of the computational model of artificial neural networks, the universal approximation properties of layered networks and estimates of the size of these networks are derived. Further, the lectures analyze the statistical aspects of classification tasks solved by neural networks.				
This lecture follows the lecture "Neural networks and their applications" and extends and complements its themes. It is assumed that students are familiar with the issues of the lecture mentioned. Some selected topics in this lecture are closely related to the content of the lecture "Probabilistic learning models" that presents these selected topics in a much broader and deeper form. Topics of the lecture NEUR II are the following:				
1. Approach to artificial neural networks from the theory of function approximation. 2. Approach to artificial neural networks from the probability theory. 3. Analysis of the solvability of selected tasks neural network models. 4. Qualitative measure of neural networks (VC-dimension, pseudodimension, sensitivity dimension). 5. Theoretical background of neural networks learning. 6. Selected advanced classification applications of artificial neural networks.				
Keywords				
Functional approximation, supervised learning, Vapnik-Chervonenkis-dimension				
Extent of individual work				
Literature and auxiliary tools				
Compulsory literature:				
[1] J. Šíma, R. Neruda. Teoretické otázky neuronových sítí. Matfyzpress. 1996				
Optional literature:				
[2] M. Anthony, P. L. Bartlett. Neural Network Learning: Theoretical foundations. Cambridge university Press, 2009.				
[3] M. Vidyasagar. A theory of Learning and Generalization. Springer 1997.				
[4] V. Roychowdhury, K-Y. Siu, A. Orlitsky. Theoretical advances in neural computation and learning. Kluwer Academic Publishers. 1994.				
[5] H. White. Artificial Neural Networks: Approximation and Learning Theory. Blackwell Publishers. Cambridge. 1992.				

