

Faculty of Civil and Environmental Engineering				
Program of education name (disciplines)	Environmental Engineering		Level and study form: III degree, part-time	
Course name:	INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS		Code: D0302	
Course type:	obligatory	semester: 4	ECTS point: 2	
Number of hours in semester:	L-10	A-0	Lb-15	Ws-0 S-0
Prerequisites:	-			
Aims and objectives of subject:	Familiarize with theory, networks type, design and application artificial neural networks in result analysis of different kinds of research making in building engineering. Teaching of application SSN method.			
Form of assessment:	Lecture – oral examination /Laboratory – design, defence of design			
Frame programme:	Biological inspiration SSN, biological neuron, properties of SSN, historical background of SSN, artificial neuron and his action, activation functions, scaling data, action of neural network, regression and classification neural models, network design, network architecture: unidirectional networks, recurrent networks, Kohonen networks, networks of radial base function. Layered networks: numbers of network parameters, linear neural networks, multi-layered networks, training control algorithm, network learning algorithm, objective function, error back propagation algorithm, “overfitting”, measures of network error. Construction and operation of simulator Statistica Neural Network: automatic designer of network, data loading, result interpretation of network action, selection of the best model.			
Learning outcomes	Write down minimum 4, maximum 8 learning outcomes retaining order: knowledge-skills-competence. Each learning outcome must be verified.			
B3_W01	Doctoral student has advanced knowledge of basic character for scientific field and science discipline and science disciplines connected with performed research area.			
B3_U01	Doctoral student is able to effectively acquire information connected with scientific different sources, also in foreign languages and achieve correct selection and interpretation of those information.			
B3_U02	Doctoral student can, using own knowledge, make critical evaluation of the test results and other creative work-own and other authors-and their contribution in development of represented discipline; in particular, can evaluate suitability and possibility of result utilization of theoretical work in practice.			
B3_K01	Understand and feel the need of continuing education, improvement of professional and personal competence, analysis of latest achievements connected with represented scientific discipline.			
References:	1. Tadeusiewicz R., Gonciarz T., Borowik B., Leper B.: Odkrywanie właściwości sieci neuronowych przy użyciu programów w języku C#. Wyd.			

	PAU, Kraków 2007. 2. Masters T.: Sieci neuronowe w praktyce. Programowanie w języku C++. WN-T, Warszawa 196. 3. Duch W., Korbicz J., Rutkowski L., Tadeusiewicz R.: Sieci neuronowe. Tom 6: Biocybernetyka i inżynieria biomedyczna. Akad. Ofic. Wyd. Exit, Warszawa 2000. 4. Osowski S.: Sieci neuronowe do przetwarzania informacji Ofic. Wyd. Polit. Warsz., Warszawa 2006. 5. Stanisław A.: Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny. Vol. 1, 2, 3. StatSoft, Kraków 2006, 2007, 2007.		
No of education effect	Verification method of learning outcome	Form of teaching (if more than one), where occurs verification	
B3_W01	Oral examination, documentation and defence of design	L, Lb	
B3_U01	Oral examination, documentation and defence of design	L, L	
B3_U02	Documentation and defence of design	Lb	
B3_K01	Participation in discussion	L, Lb	
Realizing unit:	Department of Geotechnics	Persons carrying out:	<i>dr hab. inż. Maria Jolanta Sulewska</i>
Date of program:	12.11.2012r.	Program was worked out by:	<i>dr hab. inż. Maria Jolanta Sulewska</i>