DESCRIPTION OF THE COURSES

- Course code: ARR3223
- Course title: **NEURAL NETWORKS IN AUTOMATION**
- Language of the lecturer: Polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*1*		*1*		
*Number of hours/semester**	*15*		*15*		
Form of the course completion	*Credit*		*Credit*		
ECTS credits					
Total Student's Workload					

- Level of the course (~~basic/~~advanced):
- Prerequisites: .....*none*....
- Name, first name and degree of the lecturer/supervisor: Teresa Orłowska-Kowalska, prof. dr hab. inż.
- Names, first names and degrees of the team's members: Marcin Pawlak, dr inż., Marcin Kamiński, mgr inż.
- Year:...II..... Semester:....3.....
- Type of the course (obligatory/~~optional~~):
- Aims of the course (effects of the course): *learn of detailed problems connected with design and learning of different NN types; practicing of NN application for solving technical problems.*
- Form of the teaching (traditional/~~e-learning~~):

Course description:

Introduction – popularity and effectiveness of neural networks (NN). NN operation and learning; a simple example. Initial data processing for NN: data representation, preprocessing (filtration, signal processing, time series processing, feature extraction etc.), forming of picture sets, clustering, division of the picture set to learning and testing samples. Back-propagation method and its modifications. Application of RLS algorithm for NN learning. Radial basis networks. Static and dynamic networks, algorithm GMDH. Ontogenic NN; models with decreasing and increasing architecture. Optimization of NN architecture: increase methods, reduction methods, discrete optimization methods.

- Lecture:

Particular lectures contents	*Number of hours*
1. *Introduction – popularity and effectiveness of neural networks (NN). NN operation and learning; a simple example.*	*2*
2. *Initial data processing for NN: data representation, preprocessing (filtration, signal processing, time series processing, feature extraction etc.), forming of picture sets, clustering, division of the picture set to learning and testing samples.*	*3*
3. *Back-propagation method and its modifications. Application of*	*2*

RLS algorithm for NN learning.	
4. *Radial basis networks.*	*2*
5. *Static and dynamic networks, algorithm GMDH.*	*2*
6. *Ontogenic NN; models with decreasing and increasing architecture.*	*2*
7. *Optimization of NN architecture: increase methods, reduction methods, discrete optimization methods.*	*2*

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:

Laboratory exercises are based on the application of suitable software, like *Neural Network Toolbox,* for chosen examples of design, learning, testing and optimization of neural networks.

- Project – the contents:
- Basic literature:
  1. Osowski S., Sieci neuronowe w ujęciu algorytmicznym, WNT Warszawa 1996
  2. Duch W., Korbicz J., Rutkowski L., Tadeusiewicz R., Sieci neuronowe, t. 6 Biocybernetyki i Inżynierii Biomedycznej 2000, pod red. M. Nałęcza, Akad. Ofic. Wyd. Exit, Warszawa 2000
  3. Neural Networks Toolbox for use with MATLAB®, User's Guide
- Additional literature:
  1. Żurada J., Barski M., Jędruch W., Sztuczne sieci neuronowe, PWN, 1996
- Conditions of the course acceptance/credition:
  Lecture – pass of the written test; Laboratory - presence and performing of all exercises, preparing reports.

***** - depending on a system of studies