SYLLABUS OF A MODULE

Polish name of a module	**Inteligentne systemy przetwarzania sygnałów**
English name of a module	Inteligent systems of signal processing
ISCED classification - Code	0619
ISCED classification - Field of study	*Information and Communication Technologies (ICTs), not elsewhere classified*
Languages of instruction	*English*
Level of qualification:	*2*
Number of ECTS credit points	*5*
Examination:	*EW*
Available in semester:	*A*

Number of hours per semester:

Lecture	Tutorial	Laboratory	Seminar	Project	Others
30 E	0	30	0	0	0

MODULE DESCRIPTION

Module objectives

O1.   Acquainting the student with selected methods of intelligent data processing, especially artificial neural networks.

O2.   Obtaining by the students the skills in practical application of presented methods.

O3.   Obtaining by the students the practical skills in developing solutions to intelligent data processing.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1.   The basic knowledge in the field of the arithmetic.

2.   The basic knowledge in the field of programming.

3.   The skills of working alone and in the group.

4.   The skills of correct interpretation and presentation of own activity.

LEARNING OUTCOMES

LO 1 -   Students will possess a depth theoretical knowledge in the field of the feed forward neural networks and their learning

LO 2 -   Students will possess a basic knowledge in the field of the recurrent neural networks, especially Hopfield's like networks.

LO 3 -   Students will possess a basic knowledge in the field of the optimization process with using of Hopfield networks.

LO 4 -   Students will possess a basic knowledge in the field of the construction of autoassociative memories with using of discrete Hopfield networks.

LO 5 -   Students will possess a basic knowledge in the field of the optimization process with using of evolutionary algorithms.

LO 6 -   Students will possess practical skills in developing neural networks and evolutionary programming to processing a data.

MODULE CONTENT

Type of classes – lecture	Number of hours
Lec 1 - Introduction to intelligent computational system	2
Lec 2-3 - Dimensionality reduction methods	4
Lec 4 - Basics of neural networks	2
Lec 5 - Autoencoders	2
Lec 6 - Restricted Boltzmann Machines	2
Lec 7 - Cryptography using artificial intelligence	2
Lec 8 - Continuous Hopfield Neural Networks	2
Lec 9 - Discrete Hopfield Neural networks	2
Lec 10 - Hamming neural networks	2
Lec 11-12 - Natural Language Processing	4
Lec 13 – Various application of signal processing	2

Lec 14 - Data Stream mining	2
Lec 15 - Drift detectors	2
Sum	30

Type of classes– laboratory.	Number of hours
Lab 1 – 2 - Introduction to python	4
Lab 3 - Introduction to tensorflow	2
Lab 4 - Dimensionality reduction methods	2
Lab 5 – 6 – Autoencoders	4
Lab 7 – 8 - Restricted Boltzmann Machines	4
Lab 9 – Hopfield and Hamming Neural Networks	2
Lab 10 – 11 - Natural Language Processing	4
Lab 12 – 13 - Image and Video processing	4
Lab 14 - Speech processing	2
Lab 15 - Summary and final assessment	2
Sum	30

TEACHING TOOLS

1. - lectures using multimedia presentations
2. - blackboard and chalk or whiteboards and pens
3. - laboratory guides
4. - reports from laboratory activities
5. – computer stations with software

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for laboratory exercises
F2. - assessment of the ability to apply the acquired knowledge while doing the exercises
F3. - evaluation of reports on the implementation of exercises covered by the curriculum
F4. - assessment of activity during classes

S1. - assessment of the ability to solve the problems posed and the manner of presentation obtained results - pass mark *
S2. - assessment of mastery of the teaching material being the subject of the lecture - exam

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
1.	**Contact hours with teacher**	
1.1	Lectures	30
1.2	Tutorials	0
1.3	Laboratory	30
1.4	Seminar	0
1.5	Project	0
	Total number of contact hours with teacher:	60
2.	**Student's individual work**	
2.1	Preparation for tutorials and tests	0
2.2	Prreparation for laboratory exercises, writing reports on laboratories	25
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	0
2.5	Preparation for examination	20
2.6	Individual study of literature	20
	Total numer of hours of student's individual work:	65
	Overall student's workload:	125
Overall number of ECTS credits for the module		5
Number of ECTS points that student receives in classes requiring teacher's supervision:		2,4

Number of **ECTS** credits acquired during practical classes including laboratory exercises and projects :	1,2

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, http://www.deeplearningbook.org, 2016
2. Charu C. Aggarwal, Neural Networks and Deep Learning. A Textbook, Springer, 2018
3. James P. Coughlih, Robert H. Baran: Neural Computation in Hopfield Networks and Boltzmann Machines, Univ of Delaware Pr 1995

MODULE COORDINATOR (NAME, SURNAME, INSTITUTE, E-MAIL ADDRESS)

1. dr hab. Piotr Duda, prof. PCz., piotr.duda@pcz.pl