(*faculty stamp*) **COURSE DESCRIPTION**

1. Course title: BIOLOGICALLY INSPIRED ARTIFICIAL INTELLIGENCE	**2. Course code**
3. Validity of course description: 2018/2019	
4. Level of studies: 1st cycle of higher education	
5. Mode of studies: intramural studies	
6. Field of study: Computer science	(FACULTY SYMBOL)
7. Profile of studies:	
8. Programme: ALL	
9. Semester: 6	
10. Faculty teaching the course: Institute of Computer Science	
11. Course instructor: dr hab. inż. Krzysztof Cyran, dr inż. Grzegorz Baron	
12. Course classification: common	
13. Course status: compulsory	
14. Language of instruction: English	
15. Pre-requisite qualifications: Computer Programming, Mathematical Analysis, Linear Algebra, Statistical Methods	
16. Course objectives: The goal of the course is to present methods of artificial intelligence which fundamentals are derived from nature. The methods of computational intelligence like Artificial Neural Networks, Genetic Algorithms, Evolutionary Algorithms will be presented. Biologically inspired methods are examples of nonclassical methods of data processing in parallel connectionist systems like Artificial Neural Networks or evolutionary and genetic algorithms. Student can expand his knowledge about IT from simple computer science to general information processing science.	

17. Description of learning outcomes:

Nr	Learning outcomes description	Method of assessment	Teaching methods P – project	Learning outcomes reference code
W1.	Student has general knowledge about artificial intelligence algorithms	PS	WT, P	K1A_W09
W2.	Student has knowledge about methods and tools suitable for solving simple artificial intelligence tasks	PS	WT, P	K1A_W15
U1.	Student can plan and execute experiments, interpret results and formulate conclusions	PS	P	K1A_U10
K1.	Student can cooperate in workgroup	Teacher's observations	P	K1A_K02

18. Teaching modes and hours

Lecture / BA /MA Seminar / Class / Project / Laboratory

Lecture 30h, Project 30h

19. Syllabus description:

Lecture: introduction to evolutionary algorithms and artificial neural networks, genetic algorithms, evolutionary algorithms, evolutionary strategies, evolutionary programming, chromosomes and schemas, genetic operators: selection, crossover, mutation, selection types, building block hypothesis, comparison of genetic and evolutionary algorithms, chromosome coding

Fundamentals of artificial neural networks, structure of neuron, feedforward networks, Rosenblatt's perceptron, multilayer perceptron, methods of learning, backpropagation algorithm, evolutionary learning, RBF networks, self-organizing networks, Kohonen map, Hopfield network, Technologies of ANN

Project: During the project students are obliged to solve the chosen problem using one or more of the methods of artificial intelligence. They have to develop the computer program solving the problem. They also can use existing programs or libraries for solving more complicated AI problems. Students can suggest the task themselves or can chose it from the presented list. Students work in 2-4 person groups. The general problem is divided into some separated subproblems for each student. Quality of final solution and cooperation of students are taken into consideration when the final mark is calculated.

20. Examination: NO

21. Primary sources:

1. Z. Michalewicz, Algorytmy genetyczne+struktury danych=programy ewolucyjne, Wydawnictwa Naukowo-Techniczne, Warszawa 1996.
2. Z. Michalewicz "Genetic Algorithms + Data Structures = Evolution Programs", 3rd edition, Springer-Verlag, 1996
3. S. Osowski, Sieci neuronowe w ujęciu algorytmicznym, Wydawnictwa Naukowo-techniczne, Warszawa 1999.

22. Secondary sources:

1. J. Arabas Wykłady z algorytmów ewolucyjnych, Wydawnictwa Naukowo-Techniczne, Warszawa 2001
2. D.E. Goldberg, Algorytmy genetyczne i ich zastosowania, Wydawnictwa Naukowo-Techniczne, Warszawa 1995.
3. Back, Fogel, Michalewicz, Handbook of Evolutionary Computation, Oxford University Press, 1997.
4. D. Rutkowska, M. Pliński, L. Rutkowski, Sieci neuronowe, algorytmy genetyczne i systemy rozmyte, Wydawnictwo Naukowe PWN, Warszawa 1999.
5. T. Masters, Sieci neuronowe w praktyce, WNT 1996
6. J. Korbicz, A, Obuchowicz, D. Uciński, Sztuczne sieci neuronowe, PLJ 1994
7. J. Żurada, M. Barski, W. Jedruch, Sztuczne sieci neuronowe, PWN 1996
8. C. Looney, Pattern recognition using neural networks, Oxford University Press 1997
9. Fiesler, Baele, Handbook of Neural Computation, Oxford University Press, 1997

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/5
2	Classes	/
3	Laboratory	/
4	Project	30/55
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	60/60

24. Total hours:120

25. Number of ECTS credits: 4

26. Number of ECTS credits allocated for contact hours: 2

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):1

26. Comments:

Approved:

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(date, Instructor's signature) (*date , the Director of the Faculty Unit signature)*