

SDAŃSK UNIVERSITY 的 OF TECHNOLOGY

Subject card

Subject name and code	Artificial Intelligence Methods, PG_00057476								
Field of study	Automation, Robotics and Control Systems								
Date of commencement of studies	February 2024		Academic year of realisation of subject			2023/2024			
Education level	second-cycle studies		Subject group						
Mode of study	Full-time studies		Mode of delivery			at the university			
Year of study	1		Language of instruction			Polish	Polish		
Semester of study	1		ECTS credits			5.0	5.0		
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering								
Name and surname	Subject supervisor prof. dr hab. inż. Roman Śmierzchalski								
of lecturer (lecturers)	Teachers		dr hab. inż. Michał Grochowski						
			dr inż. Bartosz Puchalski						
			Zuzanna Klawikowska						
			Insef dr. hab, int Doman Émiorzabelali						
			proi. ur nau. i	prof. of hab. Inz. Roman Smierzcha			ISKI		
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	:t	Seminar	SUM	
of instruction	Number of study	30.0	0.0	15.0	15.0	0.0 60		60	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity Participation ir classes include		n didactic Jed in study	didactic Participation in ed in study consultation hours		Self-study		SUM	
	Number of study hours	60		10.0		55.0		125	
Subject objectives	The aim of the course is to introduce students to basic notions and concepts from the field of artificial intelligence.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	K7_U08		The student learns the basic principles of conducting work and research in an industrial environment, application of occupational safety and health.			[SU1] Assessment of task fulfilment			
	K7_W05		The student learns basic computational techniques of artificial intelligence (methods of inference, learning and solution- finding) in an algorithmic approach, selects an AI algorithm to solve a specific practical technical task, implements an AI algorithm in a selected programming language (Matlab or C++) to solve problems of decision-making processes, such as e.g. forecasting, planning, diagnostics, control, optimization.			[SW1] Assessment of factual knowledge			

Subject contents	LECTURE Basic definitions of inte Tasks of artificial intelligence form search, - overview of intelligent co methods. Formal inference, task f an automatic inference system. A qualitative knowledge, fuzzy sets, numerical data. Design of fuzzy a learning, reinforcement learning - approximation method 4. Solution Random methods - climbing and r space search with genetic algorith population, adaptation function, gr implementation of classical AG. G solving optimization problems. Mu of an autonomous robot in an env Hybrid methods - techniques of co algorithms for parameter tuning of LABORATORY EXERCISES Fuzz disturbances. Synthesis of fuzzy o network learning test with teacher of genetic algorithm depending or optimization task with constraints environment using evolutionary m	CTURE Basic definitions of intelligence, artificial intelligences, scope of research on artificial intelligence. Isks of artificial intelligence formal and approximate inference, information-based learning, solution space arch, - overview of intelligent computing techniques. Examples of tasks solved by artificial intelligence thods. Formal inference, task formulation, syntax and semantics of the language of logic, construction of I automatic inference system. Approximate inference, fuzzy logic - representation and processing of lalitative knowledge, fuzzy sets, operations on sets, fuzzy logic - representation and processing of interical data. Design of fuzzy autopilot for ship heading control. Neural networks, multilayer perceptron arning, reinforcement learning - task formulation, value function, reinforcement learning as a value function iproximation method 4. Solution space search methods, evaluation function, heuristic evaluation methods. andom methods - climbing and random straying algorithm, simulated annealing algorithm. 5. solution iproximation function, genetic operators, algorithm parameters. Theoretical basis of AG. Computer iplementation of classical AG. Genetic techniques. Representation and structure of populations. AG iving optimization problems. Multicriteria optimization problem in AG. Example evolutionary route planning an autonomous robot in an environment, trajectory determination of a ship in a collision situation at sea. yord methods - techniques of combining fuzzy-neural systems (fuzzy neural networks), use of genetic gorithms for parameter tuning of fuzzy and neural models. ABORATORY EXERCISES Fuzzy controller - evaluation of control system properties, resistance to sturbances. Synthesis of fuzzy controller - techniques of creating P, PI, PID fuzzy controller. Neural sturbarces using test with teacher. Modeling of continuous industrial process using SN. Study of properties genetic algorithm depending on selection method, coding method and operators used. Solving an st				
Prerequisites and co-requisites	Knowledge from the course Fundamentals of Automatics					
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
and criteria	Report on the exercises	100.0%	30.0%			
	Project documentation	100.0%	20.0%			
	Colloquium	50.0%	50.0%			
Recommended reading	Basic literature	 G. Luger, Artificial intelligence, Prentice Hall, 2008. A. Zilouchian, M. Jamshidi, Intelligent Control Systems Using Soft Computing Methodologies, CRC Press, 2001 P. Cichosz, Systemy uczące się, Wydawnictwa Naukowo- Techniczne, Warszawa 2000. S. Osowski, Sieci neuronowe w ujęciu algorytmicznym, Wydawnictwa Naukowo-Techniczne, Warszawa 1999. J. Arabas, Wykłady z algorytmów ewolucyjnych, Wydawnictwa Naukowo-Techniczne, Warszawa 2001. Andrzej Piegat, Modelowanie i sterowanie rozmyte. Exit, 1999 L. Rutkowski , Metody i techniki sztucznej inteligencji. Wydawnictwo Naukowe PWN, Warszawa, 2005 				
	Supplementary literature	 David E. Goldberg, Algorytmy genetyczne i ich zastosowania. WNT, 1995 D. Rutkowska, M. Piliński, L. Rutkowski, Sieci neuronowe, algorytmy genetyczne i systemy rozmyte. PWN, 1997 Zbigniew Michalewicz, Algorytmy genetyczne + struktury danych = programy ewolucyjne. WNT, 1999 				
	eResources addresses	Adresy na platformie eNauczanie: METODY SZTUCZNEJ INTELIGENCJI [ARiSS][II][2023/24] - Moodle ID: 35954 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35954				
Example issues/ example questions/ tasks being completed	Artificial intelligence tasks - formal and approximate inference, information-based learning, solution space search. Fuzzy sets, operations on sets, fuzzy inference, fuzzy controller. Neural networks, multilayer perceptron learning, reinforcement learning. AG scheme and operation, population representation, initial population, adaptation function, genetic operators, algorithm parameters.					
work placement	Not applicable					