

Course code																																	
Type and description	Elective Course																																
ECTS credit	1																																
Course name	The Latest IT Trends in Civil Engineering																																
Course name in Polish	Najnowsze trendy informatyczne w budownictwie.																																
Language of instruction	English																																
Course level	8 PRK																																
Course coordinator	Dr hab. inż. Artur Wirowski																																
Course instructors	Dr hab. inż. Artur Wirowski																																
Delivery methods and course duration	<table border="1"> <thead> <tr> <th></th> <th>Lecture</th> <th>Tutorials</th> <th>Laboratory</th> <th>Project</th> <th>Seminar</th> <th>Other</th> <th>Total of teaching hours during semester</th> </tr> </thead> <tbody> <tr> <td>Contact hours</td> <td>0</td> <td>0</td> <td>0</td> <td>15</td> <td>0</td> <td>0</td> <td>15</td> </tr> <tr> <td>E-learning</td> <td>No</td> <td>No</td> <td>No</td> <td>No</td> <td>No</td> <td>No</td> <td></td> </tr> <tr> <td>Assessment criteria (weightage)</td> <td>0,00</td> <td></td> <td></td> <td>1,00</td> <td></td> <td>0,00</td> <td></td> </tr> </tbody> </table>		Lecture	Tutorials	Laboratory	Project	Seminar	Other	Total of teaching hours during semester	Contact hours	0	0	0	15	0	0	15	E-learning	No	No	No	No	No	No		Assessment criteria (weightage)	0,00			1,00		0,00	
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Course objective	The aim of the course is to familiarize doctoral students with the latest IT tools that they can use practically in their scientific work																																
Learning outcomes	<p>A PhD student after completing the course can.</p> <ol style="list-style-type: none"> 1. Choose the right IT technologies for the specifics of his scientific work - effects U4, K1 2. Apply the chosen evolutionary algorithm to a simple optimization task - effects W4, U4, K1 3. Accelerate selected numerical calculations by means of parallel calculations - effects W4, U4, K1 																																
Assessment methods	<p>Effect 1. - project seminar presentation - effects W4, U4, K1</p> <p>Effects 2 and 3 - laboratory exercises - effects W4, U4, K1</p> <p>The final grade consists of:</p> <p>The result of the project seminar presentation - 50%</p> <p>The result of laboratory exercises - 50%</p>																																
Prerequisites	none																																
Course content with delivery methods	<p>LECTURE</p> <ol style="list-style-type: none"> 1. General review of artificial intelligence algorithms. Division into various fields. 2. Evolutionary algorithms. General characteristics. Concepts: population, phenotype, genotype, function of adjustment, restrictions, crossing. Evolutionary strategies. Examples of applications in construction in optimization issues. 3. ACO its application to the optimization of building structures. 																																

	<p>4. Parallel and distributed calculations. Basic definitions, algorithms, advantages and disadvantages. Calculations supported by the GPU. Examples of using this technology to speed up numerical calculations.</p> <p>LABORATORY:</p> <ol style="list-style-type: none"> 1. Optimization of the topology of the chosen structures by means of an evolutionary algorithm 2. Optimization of the structure by means of a ACO. 3. Use GPU calculations or cloud computations to speed up selected numerical calculations <p>SEMINAR:</p> <p>Presentation on the potential use of newly learned technologies in scientific work (based on materials from the latest scientific conferences or own students materials)</p>
Basic reference materials	<ol style="list-style-type: none"> 1. Lecturer's own materials, 2. Mendes, Jorge & Greiner, David. (2015). Evolutionary Algorithms and Metaheuristics in Civil Engineering and Construction Management. 10.1007/978-3-319-20406-2 3. Qianyun Zhang, Kaveh Barri, Pengcheng Jiao, Hadi Salehi, Amir H. Alavi ,Genetic programming in civil engineering: advent, applications and future trends, Artificial Intelligence Review, Issue 3/2021 4. Restrepo-Morales, Jorge & Medina Hurtado, Santiago & Vanegas, Juan. (2016). APPLICATION OF A FUZZY INFERENCE SYSTEM TO CIVIL ENGINEERING PROJECTS, Conference: 37th International Annual Conference of the American Society for Engineering Management, USA 5. Saggu, P. Yadav, M. Roopak, Applications of Swarm Intelligence, International Journal of Computer Science and Mobile Computing, Vol. 2, Issue. 5, May 2013, pg.353 – 359 6. Lijuan LiFeng Liu, Application of Particle Swarm Optimization Algorithm to Engineering Structures, Group Search Optimization for Applications in Structural Design pp 7-20 7. S. Bialkowski, Topology Optimisation Influence on Architectural Design Process - Enhancing Form Finding Routine by tOpos Toolset utilisation., Computer Science, 2018 8. S. Cook, <i>CUDA Programming: A Developer's Guide to Parallel Computing with GPUs (Applications of Gpu Computing)</i>, Morgan Kaufmann, 2012
Other reference materials	AIP Conference Proceedings 22nd International Conference on Computer Methods in Mechanics 2017 or newer
Average student workload outside classroom	10h
Comments	none
Last update	25.04.2023