GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00066269		
Field of study	Civil Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Optional subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department Of Engineering Structures -> Faculty Of Civil And Environmental Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Przemysław Kalitowski	
	Teachers	dr inż. Marek Szafrański dr inż. Przemysław Kalitowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	0.0	30.0	0.0	30

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	30	0.0	0.0	30

Subject objectives

The aim of the course is to develop the ability to apply the concept of parametric modeling to describe phenomena or geometry in engineering problems. The course involves the use and instruction of Rhinoceros 3D and Grasshopper software for model creation.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W05] Demonstrate knowledge and understanding of research methods (obtaining information, simulations, experimental methods) in the field of civil engineering.	The student is able to apply the concept of parametric modeling in the creation of geometric and numerical models for documentation and analytical purposes.	[SW3] Assessment of knowledge contained in written work and projects
[K6_K02] Can work effectively in a group, as well as function in teams, which may consist of representatives of various branches and levels.	1. The student is able to collaborate with other students on a team-based engineering project and contribute effectively to the assessed outcome. 2. The student communicates efficiently with team members during the collaborative resolution of technical problems, contributing to the final evaluated result.	[SK4] Assessment of communication skills, including language correctness [SK1] Assessment of group work skills
[K6_K03] Can effectively, clearly and unambiguously convey information, describe activities and communicate their results/ outcomes to engineers or a wider audience using appropriate communication methods and tools.	The student prepares technical reports presenting the methods, process, and results generated by the developed algorithm.	[SK2] Assessment of progress of work
[K6_U05] Conducts research (obtaining information, simulations, experimental methods) in the field of construction in order to solve specific tasks and report research results.	The student is able to plan and carry out a parametric simulation of an engineering phenomenon using parametric modelling.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>1. Introduction to the concept of parametric modeling of phenomena and geometry. Presentation of basic best practices for solving problems using computers.
2. Learning how to use Rhino software, with a focus on the Grasshopper module.
3. Creating parametric models related to engineering problems.
4. Development of a group project in the form of a parametric model of a chosen geometry, phenomenon, or the creation of a practical tool to solve a selected problem.
5. Introduction to optimization concepts.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Project task evaluation</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1. Tedeschi, A., AAD Algorithms-Aided Design, 2014, Le Penseur
2. Tedeschi, A., & Lombardi, D. (2017). The algorithms-aided design (AAD). In Informed Architecture: Computational Strategies in Architectural Design (pp. 33-38). Cham: Springer International Publishing.
3. Zawarus, P. (2022). Landscape Performance Modeling Using Rhino and Grasshopper (1st ed.). Routledge. https://doi.org/10.4324/9781003208020</td></tr><tr><td>Supplementary literature</td><td>1. Weise, T. (2009). Global Optimization Algorithms. Theory and Application.
2. Tesch, K. (2016). Continuous optimisation algorithms. Gdansk University of Technology Publishers.
3. Goldberg, D. E. (2013). Genetic algorithms. Pearson education</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Inteligentne modelowanie konstrukcji 2024 2025 - Moodle ID: 43952
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43952</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Project of a cup with customizable shape and dimensions.
• Module generating 3D geometry of stairs (spiral/turning) with parametric selection of step geometry, stair width, and height to overcome.
• Module loading a point cloud, generating a simple MESH grid, and determining the volume of an excavation for a given rectangular foundation at a specified depth.
• Module generating a cross-section (2D or 3D) (e.g., rolled) and calculating and visualizing normal (shear) stresses for given internal forces.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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