GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer Analysis of Construction, PG_00065731		
Field of study	Civil Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department Of Structural Mechanics -> Faculty Of Civil And Environmental Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mateusz Sondej	
	Teachers	dr inż. Mateusz Sondej prof. dr hab. inż. Paweł Kłosowski mgr inż. Łukasz Żmuda-Trzebiatowski dr inż. Marcin Krajewski dr inż. Marcin Zmuda Trzebiatowski dr inż. Krzysztof Żerdzicki Szymon Kalinowski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	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	Getting to know the theoretical and practical basics of computer methods of structural analysis. Working in a Finite Element Method computing environment on the example of Autodesk Robot SAP.

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.	uses the appropriate modules of Robot SAP to perform numerical calculations in the field of: static analysis, dynamic analysis, and moving loads; uses the appropriate modules for the interpretation of results in the form of graphs, maps and tables	[SW3] Assessment of knowledge contained in written work and projects
[K6_W01] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.	can name the advantages and disadvantages of using Robot SAP in the design of typical building structures; explains which options of the Robot SAP program allow to reproduce the characteristic behavior of the designed structures; describes how Robot SAP takes into account selected building codes in its calculations	[SW3] Assessment of knowledge contained in written work and projects
[K6_U05] Conducts research (obtaining information, simulations, experimental methods) in the field of construction in order to solve specific tasks and report research results.	selects the types of finite elements that correctly reflect the behavior of the designed structures; applies degree of freedom constraints corresponding to the structure support conditions; uses load types consistent with the the project description	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_U02] Analyse & solve engineering issues & problems in the field of civil engineering by applying appropriate and relevant established analytical, numerical and experimental methods.	uses the Robot SAP program to build numerical models of building structures subjected to characteristic loads; performs calculations in terms of static and dynamic analysis; interprets whether the permissible values of stresses and displacements have not been exceeded in the designed structure based on the obtained results; recognizes whether the obtained results are reliable	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

Subject contents

General information about the commercial analysis systems. Getting familiar with a sample program basing on the finite element method: Robot Structural Analysis Professional. Selecting the right type of finite element.
Building 3D rod models:
a) linear static analysis (static load, temperature, force, moving load)
b) dynamic analysis (solution of eigenproblem, integrating the equations of motion),
c) linear stability analysis (solution of eigenproblem, method of initial stability),
d) a proper interpretation of results.
Building a simple 2D surface models (plane stress, plane strain, axisymmetric):
a) linear static analysis (static load, temperature),
b) principles of finite element mesh automatic generation,
c) a proper interpretation of results.
Cooperation of the structural analysis and CAD programs.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
passing the laboratory	60.0%	100.0%

Recommended reading

Basic literature	1. Autodesk Robot Structural Analysis software manual. 2. Marsh K.: Autodesk Robot Structural Analysis Professional 2015: Essentials. Marsh API LLC, 2014. 3. Zienkiewicz O.C.: Introductory Lectures on the Finite Element Method. Course Held at the Department of Mechanics of Solids, July 1972. Springer, Vienna 1972. 4. Bathe K.J.: Finite Element Procedures in Engineering Analysis. Prentice-Hall, New Jersey, 1982.
Supplementary literature	1. Taylor, R. L., & Zienkiewicz, O. C. (2013). *The finite element method*. Oxford, UK:: Butterworth-Heinemann.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

Analyse an engineering structure, given geometry, supporting conditions, external actions and material parameters, using different discretization variants in the FEM procedure, complemented by the result verification.

Work placement

Not applicable