GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Numerical Methods, PG_00048189		
Field of study	Civil Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Structural Mechanics Department -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mateusz Sondej	
	Teachers	dr inż. Mateusz Sondej dr inż. Marcin Krajewski mgr inż. Łukasz Żmuda-Trzebiatowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	25.0	0.0	0.0	35

E-learning hours included: 0.0

Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13646

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	35	5.0	60.0	100

Subject objectives

To gain theoretical and practical knowledge with the basics of computer methods of structure analysis. To work with the computational environment of the finite element method with the usage of Autodesk Robot Structural Analysis Professional.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] is able to define basic calculation models used in computer calculations	Can make a computational model of the structure and interpret the results	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K6_U04] can correctly choose tools (analytical or numerical) to solve engineering problems in design of structures or construction process	For a given structure, he can select an appropriate calculation model of the structure and perform a static or dynamic analysis in Robot	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_W11] Knows selected software supporting the calculation and design of construction as well as construction management	Is able to perform static and dynamic analysis in Robot	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

Finite Element Method (FEM) - basic principles of structure modeling, program structure. Modern MES engineering software. Selected FEM applications and elements of numerical methods used in structural mechanics. Structural systems: trusses, beams and frames. 2D plane structural systems (PSN, PSO, axisymmetric). Matrix methods in structural mechanics.

Prerequisites and co-requisites	Knowledge of structural mechanics and strength of materials, the basics of programming in Matlab	
Assessment methods and criteria	Subject passing criteria	Passing threshold / Percentage of the final grade
	lecture	60.0% / 20.0%
	laboratory	60.0% / 80.0%
Recommended reading	Basic literature	Rakowski G., Kacprzyk Z.: *Metoda elementów skończonych w mechanice konstrukcji.* Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1993, Kacprzyk, Z., Czumaj, P., Dudziak, S.: *Modelowanie konstrukcji budowlanych*. Oficyna Wydawnicza Politechniki Warszawskiej 2021, Ambroziak A., Kłosowski P.: *Autodesk Robot Structural Analysis podstawy obliczeń*. Wydawnictwo PG 2014.
	Supplementary literature	Ambroziak A., Kłosowski P.: *Metody numeryczne w mechanice konstrukcji*. Wydawnictwo PG, 2011, Śródka, W.: *Trzy lekcje metody elementów skończonych*. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004, Starosolski W. *Komputerowe modelowanie betonowych ustrojów inżynierskich, Wybrane zagadnienia, Tom 1 i 2*. Wydawnictwo Politechniki Śląskiej, Gliwice 2010, Dacko M., Borkowski W., Dobrociński S., Niezgoda T. Wieczorek M.: *Metoda elementów skończonych w mechanice konstrukcji.* Arkady, Warszawa 1994, Łodygowski T., Kąkol T., *Metoda elementów skończonych w wybranych zagadnieniach mechaniki konstrukcji inżynierskich*. Alma Mater, Poznań 2005, Szmelter J., Dacko M., Dobrociński S., Wieczorek M.: *Metoda elementów skończonych w statyce konstrukcji,* Arkady, Warszawa, 1979, Branicki Cz.: *Komputerowa analiza konstrukcji prętowych bezpośrednią metodą przemieszczeń*. Wydawnictwo PG, Gdańsk 1999, Zienkiewicz O.C.: *Metoda elementów skończonych*. Arkady 1972 (i inne wydania w języku np. angielskim), Kossakowski, P.: *Uwzględnienie wpływu sprężystej podatności belek w numerycznym modelowaniu stropów żelbetowych*. Przegląd Budowlany, 2014, 85.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. What type of element was used in the model, what number and degrees of freedom it has in the node? 2. Modify the model (change column spacing, material, support, load, insert release (pin), etc.). 3. Display the bending moment diagram for selected load case / combination. 4. Find the value (with an accuracy of eg three decimal places) of the greatest vertical displacement in the model and the place / node where it occurs for the worst combination. 5. How to create a load combination?	
Work placement	Not applicable	