



Subject card

Subject name and code	Basics of Numerical Methods, PG_00048220						
Field of study	Civil Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	1	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 hab. inż. Andrzej Ambroziak					
	Teachers	dr inż. Mateusz Sondej					
		dr inż. Krzysztof Żerdzicki					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Adresy na platformie eNauczenie:						
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	5.0	65.0	100		
Subject objectives	The aim of the subject is to present theoretical and practical knowledge on the computer methods used for structural analysis of civil engineering objects. The practical part is realized using the finite element method analysis performed in the commercial software Autodesk Robot Structural Analysis Professional and Abaqus.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U06] is able to choose proper tools (measuring, analytical or numerical) to solve engineering problems, to acquire, filtrate, proces and analyse data	Students knows the tools of computer methods used for structural analysis.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information		
	[K7_W04] has knowledge on advanced strength of materials, modeling and optimisation of materials and constructions; has knowledge of fundamentals of Finite Element Method and general nonlinear analysis of engineering constructions and systems	Student knows how to perform static and dynamic analysis of civil engineering structures.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[K7_W01] has knowledge of higher mathematics, physics and chemistry, which is a base of subjects, such as construction theory and advanced material technology	Students knows the theoretical basics of computer methods used for structural analysis.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[K7_U04] is able (using Finite Element Method), to define a calculation model and to perform advanced numerical analysis of complex constructions in: linear range and elementary nonlinear range, can critically evaluate the results of calculations.	Student knows how to perform static and dynamic analysis of civil engineering structures.			[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		
Subject contents	Examples of finite element method application. Creating numerical models and discretization. Basics of FEM for bar and shell structures. Element types and kinds of analysis. Local and global formulation of FEM. Advantages and disadvantages of computer methods. Risk and error sources in FEM.						

Prerequisites and co-requisites	Structural Mechanics, Strength of Materials, Continuum Mechanics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		60.0%	20.0%
		60.0%	80.0%
Recommended reading	Basic literature	<p>Szmelter J.: Metody komputerowe w mechanice. BNI, Warszawa, 1980.</p> <p>Cichoń C., Cecot W., Krok J., Pluciński P.: Metody komputerowe w liniowej mechanice konstrukcji, Politechnika Krakowska, 2009.</p> <p>Zienkiewicz O.C.: Metoda elementów skończonych. Arkady 1972.</p> <p>Łodygowski T., Kąkol W.: Metoda elementów skończonych w wybranych zagadnieniach mechaniki konstrukcji inżynierskich. Politechnika Poznańska 2003.</p> <p>Ambroziak A., Kłosowski P.: Autodesk Robot Structural Analysis podstawy obliczeń. Politechnika Gdańska, 2010.</p> <p>Ambroziak A., Kłosowski P.: <i>Autodesk Robot Structural Analysis Wymiarowanie konstrukcji stalowych i żelbetowych</i>. Wydawnictwo PG, 2015.</p>	
	Supplementary literature	<p>Rakowski G. (red.): Mechanika Budowli z elementami ujęcia komputerowego. Arkady, Warszawa, 1991.</p> <p>Branicki C., Wizmur M.: Metody macierzowe w mechanice budowli i dynamika budowli. Politechnika Gdańska, 1984.</p>	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		