



Subject card

Subject name and code	Finite Element Method - application, PG_00040304						
Field of study	Civil Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-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	3	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Katedra Wytrzymałości Materiałów -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Łukasz Pyrzowski					
	Teachers	dr inż. Łukasz Pyrzowski prof. dr hab. inż. Wojciech Witkowski dr hab. inż. Mikołaj Miśkiewicz prof. dr hab. inż. Jacek Chrościelewski dr inż. Bartosz Sobczyk					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	0.0	30.0	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	5.0		40.0	75	
Subject objectives	Familiarizing students with selected aspects of the practical application of FEM in engineering.						
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	A student is able to assess the suitability of various FEM environments to solve specific problems.					
	[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.	A student can apply the appropriate numerical tools required to solve the task being analyzed.					
	[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	A student is able to build appropriate models of system analysis including nonlinearities encountered in mechanics.					
	[K7_W01] has knowledge of higher mathematics, physics and chemistry, which is a base of subjects, such as construction theory and advanced material technology	A student understands the mathematical basis of MES.					

Subject contents	<p>Introduction to non-linear structure analysis. Methods of tracking nonlinear balance paths. Presentation of selected advanced commercial and own FEM systems. Numeric integration, locking effect. Selected application of FEM, calculation of structures. Comments on convergence of solutions, verification and interpretation of results.</p>		
Prerequisites and co-requisites	<p>BSP020 Mechanika budowli</p> <p>BSP021 Metody obliczeniowe</p> <p>BSP022 Komputerowa analiza konstrukcji</p> <p>BSD048 Metoda Elementów Skończonych</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		60.0%	100.0%
Recommended reading	Basic literature	<p>RAKOWSKI G., KACPRZYK Z.: Metoda elementów skończonych w mechanice konstrukcji. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005.</p> <p>KLEIBER M (red): Komputerowe metody mechaniki ciał stałych. Mechanika Techniczna t. XI. PWN, Warszawa 1995.</p> <p>ZIENKIEWICZ O.C.: Metoda elementów skończonych. Arkady 1972.</p> <p>ZIENKIEWICZ O.C., TAYLOR R.L., ZHU J.Z.: Finite Element Method: Volume 1- Its Basis & Fundamentals. Volume 2 - For Solid and Structural Mechanics. Butterworth Heinemann, London 2006.</p> <p>BATHE K.-J.: Finite Element Procedures. Prentice Hall New Jersey 1996.</p>	
	Supplementary literature	<p>CHRÓŚCIELEWSKI J., MAKOWSKI J., PIETRASZKIEWICZ W.: Statyka i dynamika powłok wielopłatowych. Nieliniowa teoria i metoda elementów skończonych. PAN IPPT, Biblioteka Mechaniki Stosowanej Serii A, monografie, Warszawa 2004.</p> <p>KREJA I.: Mechanika Ośrodków Ciągłych. Wydawnictwo CURE, Politechnika Gdańska, Gdańsk 2003.</p>	
	eResources addresses	<p>Adresy na platformie eNauczenie:</p> <p>METODA ELEMENTÓW SKOŃCZONYCH - ZASTOSOWANIA - 2023/2024 - Moodle ID: 36578</p> <p>https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36578</p>	
Example issues/ example questions/ tasks being completed	Preparation of a seminar presentation on the practical application of FEM in structure analysis.		
Work placement	Not applicable		