



Subject card

Subject name and code	Structural Analysis II, PG_00044307						
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 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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			7.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Structural Mechanics Department -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Łukasz Smakosz				
	Teachers		dr inż. Łukasz Smakosz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	25.0	25.0	0.0	0.0	0.0	50
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie: Mechanika Budowli II - 2023/2024 - Moodle ID: 30784 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30784						
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	50	7.0	118.0	175		
Subject objectives	Consolidation of knowledge in the field of structural mechanics. Introduction of methods for solving static problems of beam systems in matrix notation. Presentation of problems of correct modeling of engineering structures.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W03] knows basics of Continuum Mechanics, knows rules of static analysis, stability and dynamics of complex rod, shell and volume structures, both in linear and basic nonlinear regime	The student knows the algorithm of static analysis of complex beam structures using computer methods			[SW1] Assessment of factual knowledge		
	[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	The student knows the basics of matrix methods of structure analysis, with the ability to choose the right method for a given problem			[SW1] Assessment of factual knowledge		
	[K7_U03] can perform classic statical and dynamical analysis of rod structures stability (trusses, frames and ties), both statically determined and undetermined as well as surface structures (plates, membranes and shells)	The student performs an engineering structure analysis with the use of matrix methods			[SU1] Assessment of task fulfilment		

Subject contents	Matrix displacement method. Determination of stiffness and flexibility matrix of structural systems. Discretization of a structural system. Stiffness matrices of beam and frame elements (truss, beam, frame element). Condensation and modification of the stiffness matrix. Block and universal aggregation. Fundamentals of the finite element method for bar systems. Basic problems of structural modeling and simplifications related to assuming static schemes of actual structures.		
Prerequisites and co-requisites	Knowledge of structural mechanics in a classical approach for statically determinate and indeterminate beam systems. Knowledge in the strength of materials field.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	60.0%	100.0%
Recommended reading	Basic literature	1. M. Guminiak, J. Rakowski: Mechanika konstrukcji prętowych w ujęciu macierzowym. Wydawnictwo Politechniki Poznańskiej, 2012 2. C. Branicki, M. Wizmur : Metody macierzowe w mechanice budowli i dynamika budowli. Skrypt Politechniki Gdańskiej, 1984 3. C. Branicki : Komputerowa analiza konstrukcji prętowych Bezpośrednią Metodą Przemieszczeń. Politechnika Gdańska, 1999. 4. G. Rakowski (red.) : Mechanika Budowli z elementami ujęcia komputerowego, Arkady, Warszawa, 1991. 5. M.K. Jasina : Mechanika Budowli – Macierzowa analiza konstrukcji, statyka, Materiały dydaktyczne KMB, Gdańsk, 2004	
	Supplementary literature	1. T. Chmielewski, H. Nowak: Wspomaganie komputerowe „CAD CAM”, Opole. 2. G. Rakowski, Z. Kacprzyk „Metoda elementów skończonych w analizie konstrukcji” Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1993. 3. O.C. Zienkiewicz „Metoda elementów skończonych” Arkady, Warszawa 1972.	
	eResources addresses	Mechanika Budowli II - 2023/2024 - Moodle ID: 30784 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30784	
Example issues/ example questions/ tasks being completed	1. Divide a given static system into elements. Describe degrees of freedom. 2. Determine the stiffness and flexibility matrix of a planar beam system. 3. What is a beam element stiffness matrix? What is the physical interpretation of its individual columns? 4. Provide an algorithm for the construction of a global system of equations in the problems of statics.		
Work placement	Not applicable		