GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Structural Analysis II, PG_00044307		
Field of study	Civil Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
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	blended-learning
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		

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: 22.0

Mechanika Budowli II - 2022/2023 - Moodle ID: 23812
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23812

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_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
[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_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

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	

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 p[lanar 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