



Subject card

Subject name and code	Basics of Computer Mechanics, PG_00064911						
Field of study	Civil Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2026/2027		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Mechanics of Materials and Structures -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Agnieszka Sabik				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	20.0	0.0	0.0	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		0.0		0.0	30
Subject objectives	The course is aimed at solving structural mechanics problems with the use of numerical methods, e.g. the Matrix Slope and Deflection Method and the Finite Element Method (FEM).						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U05] Conducts research (obtaining information, simulations, experimental methods) in the field of construction in order to solve specific tasks and report research results.		The student is able to interpret the results of structural engineering software, to apply it for further analysis in the field of structural mechanics.		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_W05] Demonstrate knowledge and understanding of research methods (obtaining information, simulations, experimental methods) in the field of civil engineering.		The student knows the theoretical background of the matrix displacement method and the finite element method.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_W01] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.		The student uses matrix calculus to solve structural mechanics problems.		[SW1] Assessment of factual knowledge		
	[K6_U02] Analyse & solve engineering issues & problems in the field of civil engineering by applying appropriate and relevant established analytical, numerical and experimental methods.		The student defines basics computational models for analysis of structural mechanics problems. The student implement algorithms of direct displacement methods within the MATLAB environment.		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	Course content – lecture Matrix displacement method. Discretization of the system. Global stiffness and compliance matrix of a wire system. Local stiffness matrix of a beam, truss or frame element. Transformation matrix. Global stiffness matrix aggregation. Displacement vector extraction. Determining forces in wires. Algorithm of the displacement method. Condensation and modification of stiffness matrix. Spring supports. Foundations of the finite element method. Plane stress/strain element. Application of the finite element method in solving engineering problems.		
Prerequisites and co-requisites	Knowledge of structural mechanics and strength of materials, in particular the ability to solve statically indeterminate systems. Programming skills in MATLAB.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Skill test	50.0%	25.0%
	Project	50.0%	50.0%
	Test	50.0%	25.0%
Recommended reading	Basic literature	1. Rucka M., Burzyński S., Sabik A., Macierzowa analiza konstrukcji prętowych w środowisku Matlab, Wydawnictwo PG, 2018.  2. Chmielewski Tadeusz , Nowak Henryk, Sadecka Lilianna, Metoda przemieszczeń i podstawy MES Obliczenia w środowisku MatLab, PWN, 2016.  3. Kłosowski P., Ambroziak A., Metody numeryczne w mechanice z przykładami w programie MATLAB. Wydawnictwo PG, Gdańsk 2011.  4. Obara P., Metoda przemieszczeń w analizie konstrukcji prętowych, Wydawnictwo Politechniki Świętokrzyskiej, 2011.  5. Rakowski G., Kacprzyk Z., Metoda elementów skończonych w mechanice konstrukcji. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005.	
	Supplementary literature	1. Branicki Cz. , Ciesielski R., Kacprzyk Z., Kawecki J., Kączkowski Z., Rakowski G., Mechanika budowli. Ujęcie komputerowe t. 1, Arkady, Warszawa 1991.  2. Rakowski G., Kacprzyk Z., Metoda elementów skończonych w mechanice konstrukcji .Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Aggregate the global stiffness matrix of the wire system with the use of the indicated functions in the MATLAB environment. Using own program of the matrix displacement method create diagrams of internal forces and sketch the deformation of the given structure. Determine the distribution of displacements, strains and stresses in the given plane stress system.		
Practical activities within the subject	Not applicable		

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