



Subject card

Subject name and code	Computer Analysis of Construction, PG_00065731							
Field of study	Civil Engineering							
Date of commencement of studies	October 2023	Academic year of realisation of subject			2025/2026			
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study			
Mode of study	Full-time studies	Mode of delivery			at the university			
Year of study	3	Language of instruction			Polish			
Semester of study	6	ECTS credits			2.0			
Learning profile	general academic profile	Assessment form			assessment			
Conducting unit	Department of Structural Mechanics -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology							
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Zmuda Trzebiatowski						
	Teachers							
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM	
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30	
	E-learning hours included: 0.0							
	eNauczenie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=4124							
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 objective of the course is the practical application of knowledge gained in Engineering Mechanics, Strength of Materials, Structural Mechanics, and Structural Dynamics through the modeling of frame structures and selected 2D systems (Plane Strain, Plane Stress, axial symmetry) using finite element method (FEM) software.							

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.	Acquiring practical skills related to generating geometry for simple finite element models in three-dimensional space (frame structures) and 2D systems (Plane Stress, Plane Strain, axial symmetry), as well as performing numerical simulations within the scope of linear statics and dynamics.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K6_U02] Analyse & solve engineering issues & problems in the field of civil engineering by applying appropriate and relevant established analytical, numerical and experimental methods.	Acquiring the skills for the correct interpretation of numerical simulation results for the aforementioned static systems, strictly based on the knowledge gained in previous courses in Engineering Mechanics, Strength of Materials, Structural Mechanics, and Structural Dynamics.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K6_W05] Demonstrate knowledge and understanding of research methods (obtaining information, simulations, experimental methods) in the field of civil engineering.	Acquiring necessary skills to build finite element models of selected structural systems, specifically in determining the appropriate level of discretization, defining boundary conditions, and adopting correct material data.	[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.	Acquiring skills related to the correct execution of simulations, involving the determination of analysis parameters (especially for stability and dynamics issues) and the practical application of relevant design codes.	[SW3] Assessment of knowledge contained in written work and projects
Subject contents	<p>Course content – laboratory</p> <p>Project Assignment No. 1:</p> <p>Selection of the appropriate finite element type. Building 3D frame models:</p> <ul style="list-style-type: none"> • Linear static analysis (static loads, thermal loads, imposed displacements, moving loads), • Dynamic analysis (eigenvalue problem solution, integration of equations of motion), • Linear stability analysis (eigenvalue problem solution, initial stability method), • Proper interpretation of results. <p>Project Assignment No. 2:</p> <p>Building simple 2D surface models (Plane Stress, Plane Strain, axisymmetric):</p> <ul style="list-style-type: none"> • Linear static analysis, • Principles of automatic finite element mesh generation, • Proper interpretation of results. 		
Prerequisites and co-requisites	Possession of the necessary competencies acquired in courses on Engineering Mechanics, Strength of Materials, Structural Mechanics, and Structural Dynamics.		

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		Oral exam on both projects	60.0%
Recommended reading	Basic literature	<p>1. Autodesk Robot Manual</p> <p>2. Ambroziak A., Kłosowski P.: Autodesk Robot Structural Analysis podstawy obliczeń. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2010.</p> <p>3. Ambroziak A., Kłosowski P.: Autodesk Robot Structural Analysis. Wymiarowanie konstrukcji stalowych i żelbetowych - przykłady obliczeń. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2014.</p> <p>4. Falborski T., Knabe W., Perliński A., Urbańska-Galewska E.: Wybrane zagadnienia projektowania stalowych konstrukcji prętowych z wykorzystaniem programu Autodesk Robot Structural Analysis. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2024.</p>	
	Supplementary literature	<p>5. Kacprzyk Z., Czumaj P., Dudziak S.: Modelowanie konstrukcji budowlanych. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 2021.</p> <p>6. Zienkiewicz O.C.: Metoda elementów skończonych. Arkady, Warszawa 1972.</p> <p>7. Rakowski G., Kacprzyk Z.: Metoda elementów skończonych w analizie konstrukcji. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1993.</p> <p>8. Dacko M., Borkowski W., Dobrociński S., Niezgoda T., Wieczorek M.: Metoda elementów skończonych w mechanice konstrukcji. Arkady, Warszawa 1994.</p>	
	eResources addresses		

<p>Example issues/ example questions/ tasks being completed</p>	<p>1. Model Construction</p> <ul style="list-style-type: none"> • Geometry Definition: structural axes, nodes, members (cross-sections, material, gamma angle), supports, releases (hinges), offsets, claddings, editing. • Static Load Definition: load cases, loads, combinations, modifications. • Non-static Load Definition: temperature, imposed displacements (enforced motion). • Moving Load Definition: vehicle, moving load path (route). • Modal Analysis (Free Vibration): parameters. • Integration of Equations of Motion: parameters (method, time step). <p>2. Results Analysis</p> <ul style="list-style-type: none"> • Graphical Form: diagrams (internal forces, reactions, stresses, deformations). • Tabular Form: table configuration (selection of elements, load cases), result precision. • Detailed Member Analysis: values of internal forces and displacements at any cross-section of the member. • Moving Load Results: results for individual components, envelopes, influence lines. • Modal Analysis Results: values (frequency, period, angular frequency, eigenvalue), mode shapes. • Results of Equations of Motion Integration: time-history plots of displacements, velocities, and accelerations.
<p>Practical activities within the subject</p>	<p>Not applicable</p>

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