GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Theory of elasticity and plasticity, PG_00042222
Field of study	Civil Engineering

Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	second-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	1	Language of instruction	English
Semester of study	1	ECTS credits	5.0
Learning profile		Assessment form	exam

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. Marek Skowronek
	Teachers	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	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	60	5.0	60.0	125

Subject objectives	Determination of stresses, strains and deflections in 2D systems - plane stress, plates at bending Determination of safety reserves due to plasticity in 2D and 3D stress states

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	The student resembles the problems of solid body mechanics in the subject range	[SU1] Assessment of task fulfilment
	[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 formulates and solves the problems of solid body mechanics in the subject range	[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 resembles the problems of solid body mechanics in the subject range	[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 resembles the problems of solid body mechanics in the subject range	[SW1] Assessment of factual knowledge

Subject contents	Course content – lecture Preliminaries. Assumptions and scope of theory of elasticity. Tensor calculus, Cartesian tensors, tensor algebra, differential operators, integral theorems. Plane stress and plane strain. Airy function in plane stress, plane stress solutions in Cartesian and polar coordinates. Kinematics of continuum, deformation tensors and strain tensors, compatibility conditions. Stress state, Cauchy stress tensor. Balance principles in the theory of elasticity, groups of equations in the theory of elasticity. Constitutive laws, linearly elastic material, generalized Hooke's law, Lame and engineering constants, hyperelastic materials. Strong formulation of the boundary problem, remarks on weak formulation. Theory of thin elastic plates, kinematic assumptions, stresses and strains, equilibrium of a plate, boundary conditions, rectangular and circular plates – examples, plate strips. Elements of theory of plasticity.		
Prerequisites and co-requisites	Structural Mechanics Strength of Materials		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	tests	60.0%	100.0%
Recommended reading	Basic literature	1. Holzapfel G.: Nonlinear Solid Mechanics. A continuum approach for engineers. John Wiley & Sons 2000. 2. Bielewicz E.: Strength of Materials. Politechnika Gdańska, Gdańsk 1992. 3. Fung Y.C.: Podstawy mechaniki ciała stałego. PWN Warszawa, 1969. 4. Girkmann K.: Dźwigary powierzchniowe. Arkady, Warszawa 1957 (transl. R. Dąbrowski). 5. Kączkowski Z.: Płyty – obliczenia statyczne. Arkady, Warszawa 1980. 6. Kmiecik M., Wizmur M., Bielewicz E.: Analiza nieliniowa tarcz i płyt. Wyd. PG, Gdańsk 1995. 7. Kreja I.: Continuum Mechanics. Wydawnictwo CURE, Politechnika Gdańska, Gdańsk.	
	Supplementary literature	no items	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Practical activites within the subject	Not applicable		

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