GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Theory of Elasticity and Plasticity, PG_00044329		
Field of study	Civil Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Optional subject group
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Structural Mechanics Department -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marek Skowronek	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	10.0	0.0	0.0	0.0	20

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	20	5.0	50.0	75

Subject objectives

Fundamentals of 2D and 3D system analysis. Classification of governing equations of material continuum. Selected analytical methods of 2D systems. Review of yield criteria

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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 takes fundamentals on advanced topics of mechanics of materials, material and structural modelling, FEM theoretical background and general approach to nonlinear engineering problems. The student analyses ultimate, yield-related limit states in two-dimensional problems	
[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 selects the tools (analytical or numerical) to solve engineering problems. The student takes a fundamental analytical background of bar and 2D structures.	
[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 is familiar with solid body mechanics, recognizes the analytical fundamentals of static, dynamic and stability analysis of bar, 2D and 3D structures. The student resembles elastic and elastic-plastic performance od 2D structural cases	
[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 conducts classical static, dynamic and stability analysis of bar structures (trusses, frames and cables), including statically determinate and indeterminate, 2D structures (plane stress, plates at bending, shells, membranes). The student identifies the 2D problem and performs relevant analytical solution	

Subject contents	Tensor algebra and analysis. Geometric and stress description of a solid body, material equations. Plate theory preliminaries. Introduction to plasticity theory. The two-dimensional problems, the Airy stress function in Cartesian and polar systems, axisymmetric cases. Plate examples - plate strip, axisymmetric cases. Safety margin in complex stress cases.	
Prerequisites and co-requisites	Structural mechanics, mathematics	
Assessment methods and criteria	Subject passing criteria: test	Passing threshold: 60.0% / Percentage of the final grade: 100.0%
Recommended reading	Basic literature	Bielewicz E.: Wytrzymałość materiałów. Politechnika Gdańska, Gdańsk 1992 (lub inne wydania) Fung Y.C.: Podstawy mechaniki ciała stałego. PWN Warszawa, 1969 Girkmann K.: Dźwigary powierzchniowe. Arkady, Warszawa 1957, tłumaczenie R. Dąbrowski. Kączkowski Z.: Płyty – obliczenia statyczne. Arkady, Warszawa 1980 Kmiecik M., Wizmur M., Bielewicz E.: Analiza nieliniowa tarcz i płyt. PG, Gdańsk 1995 Kreja I.: Mechanika Ośrodków Ciągłych. Wydawnictwo CURE, Politechnika Gdańska, Gdańsk 2003. Sawicki A.: Mechanika kontinuum, wprowadzenie. Wydawnictwo IBW PAN, Gdańsk 2004.
	Supplementary literature	no items
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	The stresses in plane stress cases and plates at bending Equations and unknowns of elasticity problem	
Work placement	Not applicable	