



Subject card

Subject name and code	Theory of elasticity and plasticity, PG_00042222						
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		
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	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. Marek Skowronek					
	Teachers						
Lesson types and methods of instruction	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_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		
	[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_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_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		

Subject contents	<p>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, Lamé 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.</p>								
Prerequisites and co-requisites	Structural Mechanics Strength of Materials								
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 463 790 495">Subject passing criteria</th> <th data-bbox="799 463 1139 495">Passing threshold</th> <th data-bbox="1144 463 1492 495">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 501 790 528">tests</td> <td data-bbox="799 501 1139 528">60.0%</td> <td data-bbox="1144 501 1492 528">100.0%</td> </tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	tests	60.0%	100.0%		
Subject passing criteria	Passing threshold	Percentage of the final grade							
tests	60.0%	100.0%							
Recommended reading	Basic literature	<ol style="list-style-type: none"> 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. Kmieciak 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	Adresy na platformie eNauczanie:							
Example issues/ example questions/ tasks being completed									
Work placement	Not applicable								