



Subject card

Subject name and code	Strength of Materials, PG_00064120						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		6.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Division of Applied Mechanics and Biomechanics -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Oleksii Nosko				
	Teachers		dr inż. Alicja Stanisławska dr inż. Krzysztof Jasiński dr hab. inż. Oleksii Nosko				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	15.0	0.0	0.0	75
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 7719 Wytrzymałość materiałów, W, IMM, sem. 03, zima 26/27 (PG_00064120) https://enauczanie.pg.edu.pl/2025/course/view.php?id=7719 Moodle ID: 7719 Wytrzymałość materiałów, W, IMM, sem. 03, zima 26/27 (PG_00064120) https://enauczanie.pg.edu.pl/2025/course/view.php?id=7719 Moodle ID: 7719 Wytrzymałość materiałów, W, IMM, sem. 03, zima 26/27 (PG_00064120) https://enauczanie.pg.edu.pl/2025/course/view.php?id=7719						
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	75		10.0		65.0	150
Subject objectives	The course provides students with knowledge of Strength of Materials. The basic terms, assumptions, principles and methods of the subject are treated. The main emphasis is on the development of skills to efficiently schematise, solve and analyse typical problems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U04] is able to utilize empirical, analytical, simulation, and computer-based methods to formulate and solve engineering tasks in the field of medical and mechanical engineering		Student can apply knowledge related to the strength of materials to solve problems referring to the mechanical and medical engineering		[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		
	[K6_W03] has knowledge in rigid body mechanics, biomechanics, modelling of mechanical system, vibration and strength analysis of mechanical structures or knowledge in the use of computer programs for analyzing and simulating mechanical systems, and the design process		Student can apply knowledge related to the strength of materials to analyse mechanical strength of materials and products		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		

Subject contents	Course content – lecture		
	Introduction and terminology. Normal force. Shear force. Twisting moment. Bending moment. Normal stress. Shear stress. Pascal. Normal strain. Shear strain. Stress-strain diagram. Yield stress. Ultimate stress. Elasticity. Plasticity. Condition of stress. Working stress. Geometry of cross sections. Moments of inertia. Parallel-axis theorem. Principal axes. Principal moments of inertia. Tension and compression. Axial force. Hooke's law. Elastic modulus. Poisson's ratio. Torsion. Shaft. Angle of twist. Shear modulus. Bending stresses. Beam. Pure bending. Transverse force. Neutral axis. Section modulus. Bending deflections. Elastic curve. Deflection of beam. Equation of the elastic curve. Combined loading. Skew bending. Eccentric axial loading. Frame. Strength theories. Stress tensor. Stress vector. Principal stresses. Mohr's circles. Strength theory. Equivalent stress.		
	Course content – exercises		
Prerequisites and co-requisites	Static moments and centroid. Moments of inertia. Principal moments of inertia. Stresses in an axially loaded bar. Displacements in an axially loaded bar. Stresses in a pin-joint truss. Bar systems with a rigid element. Torsion of a circular shaft. Bending moments in a beam. Stresses in a beam. Deflections and slopes in a beam. Combined loading of a cross section. Bending stresses in a plane frame. Equivalent stress. Stresses in a frame.		
	Course content – laboratory		
	Static tensile and compression tests. Metal specimen tension test: determination of the elasticity modulus, conventional elasticity limit and conventional plasticity limit. Investigation of metal hardness. Metal specimen torsion test and determination of the shape elasticity modulus. Beam deflection investigation. Metal impact strength test. Impact test of a metal tension.		
Assessment methods and criteria	Knowledge of Higher Mathematics, specifically: algebra, trigonometry, geometry, differential and integral calculus, vector and matrix calculus. Knowledge of Mechanics, specifically: static equilibrium conditions, the principle of conservation of mechanical energy.		
	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	56.0%	50.0%
	Labs	56.0%	25.0%
Recommended reading	Practice		
	56.0%		
	25.0%		
	25.0%		
Example issues/ example questions/ tasks being completed	Basic literature		
	1. A. Jakubowicz, Z. Orłóś, Wytrzymałość materiałów, wyd. 5, Wydawnictwa Naukowo-Techniczne, Warszawa, 1978.		
	2. Z. Dyląg, A. Jakubowicz, Z. Orłóś, Wytrzymałość materiałów, tom 1, wyd. 2, Wydawnictwa Naukowo-Techniczne, Warszawa, 1999.		
Example issues/ example questions/ tasks being completed	3. M. Banasiak, K. Grossman, M. Trombski, Zbiór zadań z wytrzymałości materiałów, wyd. 2, Wydawnictwo Naukowe PWN, Warszawa, 1998.		
	Supplementary literature		
	1. J.M. Gere, B.J. Goodno, Mechanics of materials: Brief edition, Cengage Learning, 2012.		
Example issues/ example questions/ tasks being completed	2. A. Pytel, J. Kiusalaas, Mechanics of materials, 2nd ed., Cengage Learning, 2012.		
	3. W.A. Nash, M.C. Potter, Schaums outline of strength of materials, 5th ed., McGraw-Hill, 2011.		
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Find the size a at which the bar carries the loads with safety factor n . $L=2$ m, $\sigma_{yp}=100$ MPa, $q=2$ kN/m, $n=2$.		
	2. Find the maximum intensity m of the twisting moment at which the shaft can carry the loads without yielding. $L=0.7$ m, $a=8$ mm, $\tau_{yp}=60$ MPa.		
	3. Find the minimum size a at which the beam can carry the bending load without yielding. $L=2$ m, $t=1.5$ mm, $\sigma_{yp}=80$ MPa, $w_0=90$ N/m.		
Example issues/ example questions/ tasks being completed	4. Find the deflection and slope angle φ (in degrees) of the beam at the force application point. $L=1$ m, $EI=5 \cdot 10^5$ Nm ² , $F=300$ N.		
	5. Find the maximum load P which can be carried by the cross section without yielding. $a=60$ mm, $t=5$ mm, $\sigma_{yp}=400$ MPa, $\psi=45^\circ$.		

Practical activities within the subject	Not applicable
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