



Subject card

Subject name and code	Materials strength, PG_00055053						
Field of study	Management and Production Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2025/2026		
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			7.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Mirosław Gerigk				
	Teachers						
Lesson types and methods of instruction	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						
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		14.0		86.0	175
Subject objectives	The aim of the course is to familiarize students with methods applied in the area of strength of materials						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U01] can find the necessary information in professional literature, databases and other sources, knows basic scientific and technical journals in the field of production management, quality and operation management, can integrate the obtained information, formulate conclusions and justify opinions	Student can apply knowledge related to the strength of materials to solve problems referring to the managements	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K6_W02] has knowledge of materials, their properties and research methods, including construction materials used in the machinery industry, has ordered, theoretically founded knowledge of mechanics including modeling of mechanical systems in the field of statics, kinematics and dynamics, and has an ordered, theoretically founded knowledge in the field of strength analysis materials and products	Student can apply knowledge related to the strength of materials to analyse mechanical strength of materials and products	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_K03] is aware of the social role of a graduate of a technical university, understands the importance of non-technical aspects and effects of engineering activities including their impact on the environment and responsibility for decisions, sees the need to formulate and provide the public with information and opinions on the achievements of technology, correctly identifies and resolves dilemmas associated with the job of an engineer	Student can analyse a behavior of the system, formulate strength of materials problem and point out methods that should be used to solve this problem	[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work	
Subject contents	<p>LECTURES/TUTORIALS</p> <p>Area moments of inertia. Tension and compression of bars. Statically indeterminate problems. Thermal and assembly deformations. Torsion of bars. Bending of beams. Determination of inner forces and stresses in bars (dimensioning). Plane state of stresses. Mohr's circle. Principal stresses and maximum shear stresses. Theorem of Castigliano. Theorem of Menabrei-Castigliano. Method of Maxwell-Mohr. Buckling investigation. Calculation of statically indeterminate systems with a use of the force method. Unsymmetrical beam bending. Eccentric loading. Bending of thin-walled bars. Bending of curved bars. Calculation of thin-walled shells of revolution. Determination of stresses of the pressure vessels. Calculation of thick-walled cylindrical shells. The Lamé problem. Calculation of thick-walled pipes.</p> <p>LABS</p> <p>Static tensile and compression tests. Metal tension test: determination of elasticity modulus, conventional elasticity limit and conventional plasticity limit. Investigation of metal hardness. Metal torsion test and determination of shape elasticity modulus. Beam deflection investigation. Metal impact strength test. Impact test of a metal tension.</p>		
Prerequisites and co-requisites	The student should have basic information in the field of applied physics and mathematics, mathematical analysis, numerical methods, solid state mechanics, including kinetics and dynamics, technical drawing and the basics of programming.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tutorials passing	56.0%	30.0%
	Labs passing	56.0%	30.0%
	Lectures passing	56.0%	40.0%

Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Bąk R., Burczyński T.: Wytrzymałość materiałów z elementami ujęcia komputerowego. WNT, Warszawa 2001. 2. Dyląg Z., Jakubowicz A., Orłóś Z.: Wytrzymałość materiałów. WNT, Warszawa, t. I 1996, t. II 1997. 3. Misiak J.: Mechanika techniczna. Statyka i wytrzymałość materiałów. WNT, Warszawa 1996. 4. Kaliński K. J.: Nadzorowanie procesów dynamicznych w układach mechanicznych. Gdańsk: Wydaw. PG 2012. 5. Gallagher R. H.: Finite element analysis fundamentals. New Jersey: Prentice Hall 1975. 6. Niezgodziński M.E., Niezgodziński T.: Wzory, wykresy i tablice wytrzymałościowe. Warszawa: WNT 1996. 7. Walczyk Z.: Wytrzymałość materiałów. Wyd. PG, Gdańsk t. I 2000, t. II 2001. 8. Żmuda J.: Projektowanie konstrukcji stalowych. Wydawnictwo Naukowe PWN, 2016.
	Supplementary literature	<ol style="list-style-type: none"> 1. Ship Construction by D. J. Eyres, Butterworth-Heinemann, 2001. 2. Elements of Modern Ship Construction by David J. House, 2010. 3. Ship Construction 7th Edition, by George J Bruce, Butterworth-Heinemann, May 2012. 4. Ship Construction and Welding by Mandal, Nisith Ranjan, Springer Series on Naval Architecture, Marine Engineering, Shipbuilding and Shipping.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	