GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Materials strength, PG_00055053		
Field of study	Management and Production Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
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. Oleksii Nosko	
	Teachers	dr hab. inż. Oleksii Nosko	

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 thejob 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

<table>
<tr><td>Subject contents</td><td>LECTURES/TUTORIALS

Area moments of inertia. Tension and compression of bars. Statically indeterminable problems. Thermal and assembly deformations. Torsion of bars. Bending of beams. Determination of inner forces and stresses in bars (dimensioning). Plane state of stresses. Mohrs circle. Principal stresses and maximum shear stresses. Theorem of Castigliano. Theorem of Menabrei-Castigliano. Method of Maxwell-Mohr. Buckling investigation. Calculation of statically indeterminable 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 Lame problem. Calculation of thick-walled pipes.

LABS

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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>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.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Tutorials passing</td><td>56.0%</td><td>30.0%</td></tr>
<tr><td>Labs passing</td><td>56.0%</td><td>30.0%</td></tr>
<tr><td>Lectures passing</td><td>56.0%</td><td>40.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Bąk R., Burczyński T.: Wytrzymałość materiałów z elementami ujęcia komputerowego. WNT, Warszawa 2001.
2. Dyląg Z., Jakubowicz A., Orłoś 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 analysisfundamentals. 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.</td></tr>
<tr><td>Supplementary literature</td><td>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.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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