GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Strength of Materials, PG_00042727		
Field of study	Environmental Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
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	exam
Conducting unit	Structural Mechanics Department -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Karol Winkelmann	
	Teachers	dr inż. Marcin Krajewski dr inż. Karol Winkelmann	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	5.0	5.0	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	4.0	55.0	79

Subject objectives

Presentation of the basics of Strength of Materials.
Stresses and strains definitions. Relations between stresses, internal forces and deformations.
Identification of axial tension/compression. Technical dimensioning analysis due to ULS and SLS.
Determination of geometric characteristics of cross sections.
Identification of bending (one and two-dimensional), eccentric compression, technical shear, bending-connected shear, and simple torsion.
Analysis of complex stress states. H-M-H hypothesis (reduced stress).
Stability and deflection analysis of elements.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] has the ability to self-education, can obtain information from literature, databases and other sources, uses information technology, Internet resources; can integrate the obtained information, make their interpretation, as well as draw conclusions and formulate and justify opinions	The student is able to use basic formulas of Strength of Materials, knows how to use them for the technical dimensioning of structures and their elements. The student is able to obtain literature-based information on the state of the structure and of its elements. The student is able to relate the results of calculations to the actual structural response.	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_W08] has elementary knowledge of construction: including building materials, their strength, construction mechanics and building physics, moisture migration in buildings, heat transfer through building partitions	The student transforms stresses and strains in flat and spatial states. The student identifies respective load cases, determines the stresses on the basis of internal forces in beam systems. The student determines geometric characteristics of cross sections. The student is able to perform the technical dimensioning of beam systems due to limit states of load capacity and serviceability. The student analyzes the stability and deflection of structures.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Fundamentals of Strength of Materials.
Stresses and strains definitions.

Relations between stresses and internal forces.

Plane Stress State and Plane Strain State.

Relations between stresses and deformations.

Axial tension/compression.

Geometric characteristics of flat figures.

Static moments and center of gravity. Moments of inertia (central, main).

Simple (one-dimensional) bending.

Two-dimensional bending.

Eccentric compression.
Core of a cross section.

Technical shear.
Bending shear.

Free torsion.

Complex stress states.
Huber-Mises-Hencky (HMH) hypothesis

Stability (elastic buckling).

Deflection.

Ultimate load capacity.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Fundamentals of Mechanics
Mathematics</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>exam</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>laboratory</td><td>0.0%</td><td>20.0%</td></tr>
<tr><td>test</td><td>0.0%</td><td>20.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Górski J., Przewłócki J., Skowronek M., Winkelmann K., Mechanics and Strength of Materials. Gdansk University of Technology Publishing House, Gdańsk, 2015.
2. Bielewicz E .: Strength of materials. Gdańsk University of Technology Publishing House, Gdańsk, 1992.
3. Szymczak C., Skowronek M., Witkowski W., Kujawa M .: Strength of materials. Exercises. Gdansk University of Technology Publishing House, Gdańsk, 2002.</td></tr>
<tr><td>Supplementary literature</td><td>1. Jastrzębski P., Mutermilch J., Orłowski W .: Strength of materials. Volume I, II. Arkady, 1985.
2. Niezgodziński M., Niezgodziński T .: Strength of materials. PWN Warsaw, 1984.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Wytrzymałość Materiałów 2022/2023 - Inżynieria Sanitarna, st. niestajonarne - Moodle ID: 26030
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26030</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Calculate the numerical values of normal stresses.
Check whether the load carrying capacity of the components has been exceeded.
Calculate the axial elongation / shortening of the elements of the system.
Determine the minimum required constant wall thickness of the thin-walled box section of the beam due to bending only.
Calculate the equation of the neutral axis of the cross section. Based on the obtained equation, create a drawing of the normal stress projection onto the cross-sectional plane.
Calculate the numerical value of shear stresses.
Make an overview diagram of shear stresses.
Check whether the eccentric compressive force is applied to the cross-sectional core.
Check whether the maximum compressive force will lead to stability loss.
Calculate the system deflection. Check if the allowable deflection is exceeded.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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