GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Strengyh of Materials, PG_00060644		
Field of study	Transport and Logistics		
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	7.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Institute Of Naval Architecture -> Faculty Of Mechanical Engineering And Ship Technology -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Mikulski	
	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	7.0	93.0	175

Subject objectives

The aim of the course is to provide theoretical foundations of mechanics and strength regimes of one-dimensional structures (rods, beams). Student after the course should be able to:

- determine the distributions of internal forces and moments
- determine the stress distribution,
- calculate the displacements of one-dimensional structures,
- indicate the place of the greatest material effort at typical structure loads,
- calculate the effort of material using a variety of strength material hypothesis.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] can work individually and in a team, communicate using various techniques in a professional environment, as well as document, analyze and present the results of his work; can estimate the time needed to complete a given task	The student is able to perform strength analyses of elements of structural systems and reloading devices.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K6_W02] has well structured knowledge of physics, including technical mechanics, fluid mechanics, solid state physics, optics and acoustics necessary to understand the basic physical phenomena occurring in transport	The student acquired the skills to solve technical problems based on the laws of mechanics and basic strength analyses.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>1. Basics assumptions and description of the Strength of Materials problems.
2. State of stress and strain: general state of stress and strains, plane stress and plane strain states. Physical relationships between stresses and strains. Hooke's law.
3. Axial tension and compression of the rod.
4. The internal forces. Statically determinate structures: beams , trusses and frames. Cross-sectional axial forces, shear forces, bending moments, torsional moments.
5. Moments of inertia of plane figures.
6. Bending of beams.
7. Torsion of monolithic and thin-walled bars.
8. Eccentric tension (compression) of the bar.
9. Shear stresses in bending problems.
10. Bending line of beam. Euler's equation.
11. Buckling of axially compressed rods.
12. Strength hypothesises. Complex stress problems.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>The student has passed the following subjects:
- General Mechanics</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>exercise</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>laboratory</td><td>50.0%</td><td>20.0%</td></tr>
<tr><td>exam</td><td>50.0%</td><td>30.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Hibbeler R.G.: Mechanics of materials, Prentice-Hall Int. Inc., 1994, ISBN 0-13-207028-6
2. Hibbeler R.G.: Statics and mechanics of materials, Prentice-Hall Int. Inc., ISBN 0023540915
3. Crayg Roy. R, Jr.: Mechanics of materials, John Willey & Sons, 1996, ISBN 0-471-50284-7
4. Beer F.P., Johnston E.R.: Mechanics of materials, Mc Graw-Hill Book Company, ISBN 0-07-004284-5
5. Ugural A.C., Fenster S.K.: Advanced Strength and Applied Elasticity, 1995, ISBN 0-13-137589-X
6. Muvdi B.B., McNabb J.W.: Egineering Mechanics of Materials, Macmillan Publ. Comp. 1984, ISBN 0-02385770-6
7. Popov E. P.: Introduction to mechanics of solids, 1968, Prentice-Hall Int. Inc., Library of Congress Catalog Card Number 68-10135
8. Gould L. Ph.: Introduction to Linear Elasticity, Springer-Verlag, 1983, ISBN 0-387-90876-5</td></tr>
<tr><td>Supplementary literature</td><td>no data available</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>What differs plane state of stresses of the plane state of strains?
What determines elongation of the axially tensioned rod?
In which case there is a beam skew bending problem?
Describe and review strength hypotheses.
What determines the critical force of the compressed rod?</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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