GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Technical Mechanics 2, PG_00056192		
Field of study	Transport and Logistics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	
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	11.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Zakład Mechaniki Konstrukcji Oceanotechnicznych -> Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Mikulski	
	Teachers	dr inż. Maciej Kahsin mgr inż. Olga Kazimierska dr hab. inż. Beata Zima dr inż. Jakub Kowalski mgr inż. Paweł Bielski dr hab. inż. Tomasz Mikulski dr inż. Michał Krężelewski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	60.0	45.0	15.0	0.0	0.0	120

E-learning hours included: 0.0

Additional information:
Lectures, exercises and laboratories are conducted in the system of full-time education.

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	120	15.0	140.0	275

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_W02] has a basic knowledge in physics, including technical mechanics, fluid mechanics, solid-state physics, optics and acoustics necessary to understand basic physical phenomena occurring in transport	The student has acquired the ability to solve technical problems based on the laws of mechanics and basic material strength analysis.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U02] can work individually and in a team, communicate through various techniques in professional environment and also record, analyse, and present the results of work, can estimate the time needed to complete a given task	The student is able to perform strength analyzes of elements of structural systems and ship or port facilitiy devices.	[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 [SU5] Assessment of ability to present the results of task

<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,frame-truss systems. 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.
13. Vibrations of a system with one degree of freedom: free and forced vibrations.
14. The phenomenon of resonance, vibration damping.
15. Introduction to vibrations of systems with many degrees of freedom.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>The student has passed the following subjects:
- Technique Mechanic I</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>50.0%</td><td>30.0%</td></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>
</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
9. S. Graham Kelly, Mechanical Vibration: Theory and Applications, SI. Centage Learning, 2011.</td></tr>
<tr><td>Supplementary literature</td><td>no data available</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<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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