GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Strength of Materials, PG_00044376		
Field of study	Civil Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	
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	8.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Katedra Wytrzymałości Materiałów -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tomasz Ferenc	
	Teachers	dr inż. Marek Jasina mgr inż. Błażej Meronk dr inż. Tomasz Ferenc	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	10.0	10.0	10.0	0.0	60

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	60	7.0	133.0	200

Subject objectives

Determination of stresses, strains and deflections in bar elements
Identification of the problems of Strength of Materials
Analysis of complex stress states
Stability analysis of structural elements
Assessment of imit load-carrying capacity of cross-sections of bar elements.

Learning outcomes

Course outcome	Subject outcome	Method of verification

Subject contents

Assumptions and the scope of Strength of Materials (SM). Stress and strain - definitions. Plane stress and plane strain. Three-dimensional stress and strain state. Hookes law (constitutive relations). Boundary problem of linear elasticity theory. Classification of problems of Strength of Materials. Axial tension (compression), statically indeterminate cases, stress concentration. Results of laboratory tests of materials 1 tension/compression. Geometrical parameters of cross-sections. Uniaxial and biaxial bending. Bending with tension/compression, core of the cross-section, eccentric compression with the tension zone excluded. Free torsion of rods. Circular and rectangular cross-sections. Open thin-walled cross-sections, closed thin-walled cross-sections (Bredt formulae). Joints of structural elements. Shear stresses at bending. Open thin-walled cross-sections, shear centre (bending centre). Compound and multiple beams. Composite beams tension/ compression, bending. Deflection line of a beam. Eulers equation, integration methods. Moment-area method (Mohrs method). Redundant cases. Potential energy of elastic strain. Clapeyrons theorem. Unit energy of elastic strain (shear, compression, bending, torsion). Castiglianos theorems calculating deflections (beams, frames, trusses), graphical integration. Stability of beams. Elastic and inelastic buckling. Design of axially compressed beams. Beams on elastic foundation, Winklers hypothesis. Strength criteria, eqiuvalent stresses. Elements of plasticity theory. Material models. Limit load-carrying capacity of a cross-section (axial tension/compression, bending, tension/compression with bending). Plasticity zones of a beam. Cables. Stresses perpendicular to the beams axis under bending. Curvilinear beams, temsion/compression, bending. Elements of rheology, time-dependent material models. Results of laboratory tests of materials 2 creep, relaxation and fatigue tests.

Prerequisites and co-requisites

Mechanics of Structures - determination of diagrams of internal forces in beam, frame and truss systems

Mathematics - basics of matrix calculus

Physics - the basics of the theory of elasticity

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><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>50.0%</td></tr>
<tr><td>test</td><td>60.0%</td><td>20.0%</td></tr>
<tr><td>laboratory</td><td>60.0%</td><td>10.0%</td></tr>
<tr><td>project</td><td>60.0%</td><td>20.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Bielewicz E. WYTRZYMAŁOŚĆ MATERIAŁÓW
2. Jastrzębski, Mutermilch, Orłowski WYTRZYMAŁOŚĆ MATERIAŁÓW
3. Jakubowicz, Orłoś WYTRZYMAŁOŚĆ MATERIAŁÓW
4. Orłowski, Słowiański WYTRZYMWŁOŚĆ MATERIAŁÓW Przykłady obliczeń.
5. Zakrzewski, Zawadzki WYTRZYMAŁOŚĆ MATERIAŁÓW
6. Rżysko J. STATYKA I WYTRZYMAŁOŚĆ MATERIAŁÓW
7. Piechnik S. WYTRZYM. MAT. DLA WYDZ.BUDOWLAN.
8. Więckowski J. WYTRZYMAŁOŚĆ MATERIAŁÓW Przykłady i teoria.
9. Piskorski, Trębacki ZBIÓR ZADAŃ Z WYTRZ. MATER.
10. Łączkowski R. WYTRZYMAŁOŚĆ MATERIAŁÓW
11. Praca zbiorowa prac. KMBiM, red. Czesław Szymczak ZBIÓR ZADAŃ Z WYTRZYMAŁOŚCI MATERIAŁÓW</td></tr>
<tr><td>Supplementary literature</td><td>no items</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Wytrzymałość Materiałów Niestacjonarne 2024/2025 - Moodle ID: 40462
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=40462</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Calculation tasks in the field of:
- determination of principal stresses, Hooke's law
- load capacity of bolted connections
- stability of the axially compressed rod
Theoretical tasks in the field of:
- the concepts of stress and strain
- geometrical characteristics of flat figures
- linear and nonlinear analyzes, orders of structure theory</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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