GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00071086						
Field of study	Civil Engineering						
Date of commencement of studies	October 2022		Academic year of realisation of subject	2025/2026			
Education level	first-cycle studies		Subject group	Optional subject group			
Mode of study	Part-time studies		Mode of delivery	at the university			
Year of study	4		Language of instruction	Polish			
Semester of study	8		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Structural Mechanics -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Krajewski					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	5.0	0.0	15.0	0.0	0.0	20
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=47889						
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	0.0	0.0	20		
Subject objectives	The aim of the course is to familiarise students with the basics of the theory of plasticity and stability of engineering structures, and to prepare them to perform stability and load-bearing capacity analyses for beam structures. During the course, students learn about the constitutive laws of materials and the principles of determining the load-bearing capacity of cross-sections and bar systems. Another important objective of the course is to develop students' skills in the use of computer-based matrix methods in structural mechanics. Students also learn how to interpret the results of computer analyses.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U05] Conducts research (obtaining information, simulations, experimental methods) in the field of construction in order to solve specific tasks and report research results.	The student is able to determine the critical load and the ultimate load for beam structures using computer methods.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_K04] Engages in independent lifelong learning and individually follows the development of science and technology in the field of civil engineering.	The student becomes familiar with real engineering structures.	[SK5] Assessment of ability to solve problems that arise in practice
[K6_K03] Can effectively, clearly and unambiguously convey information, describe activities and communicate their results/ outcomes to engineers or a wider audience using appropriate communication methods and tools.	The student is able to present the results of analyses.	[SK5] Assessment of ability to solve problems that arise in practice
[K6_K01] Is aware of the key aspects of professional, ethical and social responsibility related to management, business operation, decision making and opinion formulation in civil engineering.	The student is able to determine the state of stresses and deformations in beam structures using computer methods.	[SK5] Assessment of ability to solve problems that arise in practice
[K6_W03] Demonstrate knowledge and understanding of the processes, established standards and design methods in the civil engineering subject area and of their limitations.	Student Is able to perform linear buckling analyses and physically and geometrically nonlinear static analyses of beam structures.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture
Introduction to the **theory of plasticity**. Constitutive laws of materials.
Analysis of the **ultimate load capacity of the cross-section of a structural member**. Limit states of beams and frames.
Fundamentals of **structural stability theory**.
Examples of **stability analysis of structures**.

Course content – laboratory
Load-bearing capacity of frame and beam structures using computer-based analysis.

Stability of frame and beam structures in computer-based analysis. Matrix methods. Forms of structural instability.

Fundamentals of nonlinear static analysis of frame and beam structures using computer methods.

Prerequisites and co-requisites

The student should have knowledge in the fields of **General Mechanics**, **Strength of Materials**, and **Structural Mechanics**, as well as basic skills in **computer-based structural analysis**.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture - midterm test	0.0%	40.0%
laboratory - midterm test	60.0%	60.0%

Recommended reading

Basic literature	E. Bielewicz: Strength of Materials, Gdańsk University of Technology, Gdańsk, 1992 (or other editions). A. Biegus: Ultimate Load Capacity of Steel Frame Structures, PWN, Warsaw, 1997. P. Szeptyński: A Short Introduction to the Theory of Plasticity, 2020. G. Weiss, M. Giżejowski: Stability of Metal Structures Frame Systems, Arkady, Warsaw, 1991. K. Rykaluk: Problems of Stability of Metal Structures, Dolnośląskie Wydawnictwo Edukacyjne, Wrocław, 2012.
Supplementary literature	**P. Kłosowski:** *Robot Structural Analysis Professional in Engineering Practice*, Wydawnictwo Naukowe PWN, Warsaw, 2018
eResources addresses	

Example issues/ example questions/ tasks being completed

determine the ultimate load of the structure
identify the structural failure mechanism using computer methods
determine the critical load and the buckling mode of the structure matrix and computer methods
determine the equilibrium path computer methods
determine the internal force values in the structure according to second-order theory matrix and computer methods

Practical activites within the subject

Not applicable

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