GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Problems of Structural Mechanics, PG_00070357		
Field of study	Naval Architecture and Offshore Structures		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Specialty subject group 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	1	Language of instruction	English
Semester of study	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Marine Structures Mechanics and Technology -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Krzysztof Wołoszyk	
	Teachers	dr hab. inż. Krzysztof Wołoszyk mgr inż. Paweł Bielski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	45.0	0.0	75

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 8219 Advanced Problems of Structural Mechanics 2026
https://enauczanie.pg.edu.pl/2025/course/view.php?id=8219

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	5.0	20.0	100

Subject objectives

The purpose of the course is to familiarize students with advanced problems in structural mechanics with special emphasis on ships and marine structures. As part of the project, students will pursue a selected issue related to the mechanics of structures to be agreed with the teachers.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U04] creatively designs or modifies, either entirely or in part, a shipborne or offshore system or process according to a given specification, considering both technical and non-technical aspects, estimating costs and adopting design techniques representative for the field	The student evaluates the safety of the analyzed ship structure	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Naval Architecture and Ocean Engineering, the construction and principles of operation of marine systems, processes and their components, as well as methods and means of their design and operation	The student knows and describes advanced problems in the mechanics of ship structures	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
[K7_W04] demonstrates knowledge encompassing selected issues in the field of advanced knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Naval Architecture and Ocean Engineering	The student knows advanced computational methods used in the analysis of ship structures	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_U02] formulates and tests hypotheses concerning problems related to shipborne and offshore systems/processes, as well as simple research problems	The student formulates criteria for evaluating the strength of ship structures	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Course content – lecture

The lecture will cover the following topics in the context of ships and marine structures:

- ultimate capacity of structural elements;

- Fluid-Structure-Interaction type analyses;

- fundamentals of reliability analysis of engineering structures;

- fundamentals of fracture mechanics;

- use of FEM for advanced engineering calculations.

Course content – project

During classes students work on the selected project topic with the use of advanced methods used in the analysis of structures.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Mid-semester evaluation of the project progress	50.0%	25.0%
Presentation of project	50.0%	25.0%
Project report in the form of extended abstract	50.0%	20.0%
Test from lectures material	50.0%	30.0%

Recommended reading	Basic literature	Mansour, A., Liu, D., Strength of Ships and Ocean Structures. The Society of Naval Architects and Marine Engineers, 2008 Yao, Tetsuya, and Masahiko Fujikubo. *Buckling and ultimate strength of ship and ship-like floating structures*. Butterworth-Heinemann, 2016. Der Kiureghian, Armen. *Structural and system reliability*. Cambridge University Press, 2022.
	Supplementary literature	Richter, Thomas. *Fluid-structure interactions: models, analysis and finite elements*. Vol. 118. Springer, 2017.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Describe the problem of the limit load capacity of the ship's hull.2. To what problems are FSI methods applied to.3. Describe the problem of uncertainty in strength modeling.	
Practical activites within the subject	Not applicable	

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