GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced problems of structural mechanics, PG_00065630					
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		5.0	
Learning profile	general academic profile		Assessment form		exam	
Conducting unit	Division of Marine Structural Engineering -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej					
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Wołoszyk				
	Teachers					

Lesson types and methods of instruction	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						

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	12.0	38.0	125

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_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
	[K7_U01] applies acquired analytical, simulation, and experimental methods, as well as mathematical models for analysis and evaluation of shipborne and offshore systems and processes	The student knows how to use modern computational methods in the analysis of ship structures	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[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_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study	The student evaluates the possibility of using modern computer techniques in the analysis of ship structures	[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

Subject contents	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;
	- Dynamic analyses (e.g., collisions);
	- fundamentals of reliability analysis of engineering structures;
	- fundamentals of fracture mechanics;
	- use of FEM for advanced engineering calculations.

Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Presentation of project	50.0%	20.0%
	Test	50.0%	20.0%
	Project report	50.0%	60.0%

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.

Work placement	Not applicable

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