University of Gdańsk

Subject card

Subject name and code	Construction and Stability of a Ship II - lecture, PG_00201114						
Field of study	Marine Hydrography						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		1.0		
Learning profile	practical		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Piotr Bekier				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	26.0	0.0	0.0	0.0	0.0	26
	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	26		1.0		3.0	30
Subject objectives	Familiarizing students with the concepts of ship buoyancy, ship stability, hull geometry and structure, and performing calculations related to ship stability and strength						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[HML3-W16] knows and understands engineering standards and norms specific to the field of study, in particular those recommended by IHO and IMO	knows at an advanced level: - theoretical foundations in the field of ship stability; elements of documentation regarding ship structure and stability; - concepts of stability criteria, knows stability criteria according to IMO regulations for selected types of ships	[SW4] test/exam - oral or written
[HML3-U05] when identifying, formulating and solving engineering tasks, is able to integrate knowledge from various fields and disciplines and perceive their systemic and non-technical aspects, including ethical aspects	is able to: - determine emergency stability in the event of water ingress into the hull using the assumed mass method or the constant displacement method; - determine the ship's draft in water of different densities using documentation; - determine precisely the ship's displacement, the mass of cargo loaded or unloaded during the ship's operation and plan the loading condition; - read and use ship stability documentation; perform calculations related to ship stability; assess the ship's loading condition in terms of strength and stability	[SU4] test/exam - oral or written
[HML3-U04] is able to use analytical, simulation and experimental methods to identify, formulate and solve engineering tasks	is able to: - use methods for calculating the buoyancy and coordinates of the ship's center of mass; - use the method of determining the influence of free surfaces of liquids on the position of the ship's center of mass and its stability; - use the method of determining and checking the overall strength; - determine emergency stability in the event of water ingress into the hull using the assumed mass method or the constant displacement method; - read and use ship stability documentation; perform calculations related to ship stability; assess the ship's loading condition in terms of strength and stability	[SU4] test/exam - oral or written
[HML3-W10] knows and understands, at an advanced level, shipbuilding and construction of the ship and systems and equipment, including propulsion systems, as well as the rules of their operation and maintenance	knows at an advanced level: - materials used to build the hull, their basic mechanical characteristics, areas of application and joining technologies, basic hull bonds and their division, hull structure in the area of the bottom, sides, decks, bow, stern, foundations of machines and equipment; - concepts of hull equipment and its division, types of selected hull equipment elements, types of steering devices and propulsors, including propellers, the phenomenon of corrosion of materials used for hulls and methods of preventing it during ship operation; - theoretical foundations in the field of ship stability; elements of documentation regarding ship structure and stability	[SW4] test/exam - oral or written

Course outcome	Subject outcome	Method of verification
[HML3-W11] knows and understands, at an advanced level, rules, regulations and procedures related to the carriage of cargo by sea, in particular the physico-chemical characteristics of cargoes accepted on board and the rules for their handling	knows at an advanced level: - theoretical foundations in the field of ship stability; elements of documentation regarding ship structure and stability; - methods for determining the dynamic heel angle on the righting arms curve and the dynamic arms curve; - the influence of water density on the ship's draft	[SW4] test/exam - oral or written

Subject contents

3. SHIP STABILITY AND SUBDIVISION
Ship equilibrium conditions, displacement, and buoyancy.
Mass and coordinates of the ship's center of mass, calculation methods.
Center of buoyancy, buoyant force.
Arm of shape stability, weight stability arm, righting arm.
Hull geometry characteristics, hydrostatic data, shape arms.
Change in buoyancy and coordinates of the ship's center of mass after loading, unloading, or shifting cargo.
Influence of suspended cargoes, effect of icing on the change in the position of the ship's center of mass.
Transverse metacenter, transverse initial metacentric height. Methods of calculating metacentric height.
Influence of free surfaces of liquids on stability, calculation methods.
Calculation of the ship's static angle of heel.
Correction of static heel.
Dynamic stability: dynamic arm, work of righting arms, physical interpretation. Heeling of a ship under the influence of an external dynamic heeling moment.
Stability criteria for an intact ship, curve of permissible elevations of the ship's center of mass.
Inclining test.
Stability criteria.
Longitudinal stability.
Changes in heel, trim, and draughts during cargo and ballast operations.
Influence of seawater density on the equilibrium position and ship stability.
Methods of controlling stability during ship operation, determining the metacentric height based on the roll period.
Stability information for the master and its use.
Ship's subdivision, subdivision class, permeability.
Methods for determining the state of equilibrium of a ship in a damaged state, loss of stability and buoyancy.
Ship's equilibrium, stability, and strength during ballast water exchange.

Prerequisites and co-requisites

Subject required by the Regulation of the Minister of Infrastructure and Development of February 5, 2014, on framework training programs and examination requirements for deck department seafarers (i.e., Journal of Laws 2023, item 1566): attendance at all classes is mandatory. AMW allows students to make up for up to 20% of excused absences from these classes in a form that enables them to acquire the missing knowledge and skills. Students who have passed the course but, due to absences exceeding 20% of classes or failure to make up for classes in a form that allows them to obtain the missing knowledge and skills, do not receive an entry in the supplement confirming completion of studies recognized at the operational level in coastal shipping.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	51.0%	100.0%

Recommended reading

Basic literature	1. Dudziak J.: Teoria okrętu. Oficyna morska., 2006
Supplementary literature	1. DERRETT D. R., BARRASS C. B.: Ship stability for Masters and Mates, 2012. 2. DOKKUM VAN K.: Ship Stability. 2010. 3. SEMIKONTENEROWIEC B-354, Stateczność i wytrzymałość wzdłużna statku materiały pomocnicze, 2009.
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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