GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Maritime properties, PG_00057230		
Field of study	Ocean Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	Optional 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	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Hydromechanics and Hydroacoustics -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Paweł Dymarski	
	Teachers	mgr inż. Hanna Pruszko dr hab. inż. Paweł Dymarski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	5.0	15.0	50

Subject objectives

The main aim of the lecture is to let the students know the basic knowledge on the seakeeping of ships. Next aim is to deliver the knowledge to the students on the methods, models and tools important for the ship seakeeping estimation. The additional aim is to learn the students about the requirements concerning the ship seakeeping included in the regulations.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W05] has an organized, widened knowledge on design, construction and operation of ocean technology objects and systems	Student: is able to analyze the technical and economic aspects of engineering tasks in the field of design, construction and manufacturing of ocean engineering facilities.	[SW1] Assessment of factual knowledge
[K7_U04] can apply mathematical methods and models and computer simulations to analyse, design, and assess the functioning of ocean technology objects and systems and their elements	Student: is able to formulate an engineering task and its specification in the field of design, construction and manufacturing of ocean engineering facilities.	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_W06] has an organized, widened knowledge on engineering methods and design tools allowing the conducting of advanced projects within the construction and operation of ocean technology objects and systems	Student: knows the general principles of initiating and developing forms of entrepreneurship, including an individual based on knowledge in the field of construction and operation of ocean engineering facilities and equipment.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	LECTURE: Presentation of the CFD methods which can be applied for the seakeeping prediction including the behavior of ships. Description of potential and turbulent flows including the influence of free surface. The velocity potential indicated by a moving body and the methods of its description. The RANSE equations (using the hybrid mesh technique) including the linear condition on the free surface. Modeling of flows generated by the moving bodies. The hydrodynamic forces (sea loads) on ships using the potential and turbulent flows. The state of art on the seakeeping problems. The tools for predicting the ship seakeeping: model tests, real scale tests, analysis in frequency domain, analysis in time domain, statistical analysis. The theory of regular waves. The irregular waves theory. The state of art on the methods of prediction of theship performance in waves using the computational fluid dynamics (CFD, RANSE): strip theory, unified theory, high speed strip theory, Green function method, Rankine singularity method and the combined method using the last two methods together. The linear model of ship performance in either regular or irregular waves. The non-linear model of ship performance in waves. The analysis of ship performance in waves using the linear and non-linear models, the differences. The prognosis of the ship performance in waves. The assessment of the ship performance in waves in abnormal conditions: in beam waves, in following waves, in breaking waves, in frick waves, etc. LAB: Investigation of waves including the measurements. Model tests of ship performance in regular waves. Assessment of the ship performance in regular waves. Prediction of the ship performance in irregular waves using the results of model tests in regular waves. . The prognosis of the ship performance in waves.
Prerequisites and co-requisites	Student should have the basic knowledge on the theory of ships and ship hydromechanics including the ship floatability, stability, resistance and propulsion, manoeuvrability and seakeeping. Student should have the knowledge on modeling the basic hydromechanic phenomena and calculation of the hydromechanic forces (sea loads). Student should have the knowledge on the mathematical analysis, differential and partial equations, numerical methods i computational fluid dynamics (CFD).
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
written exam	60.0%	60.0%
practical exercises	100.0%	40.0%

Recommended reading	Basic literature	1. Janusz Staliński: Teoria okrętu, Wydawnictwo Morskie, Gdańsk 1969; 2. Lesław Buczkowski: Podstawy budownictwa okrętowego - Część I, Skrypt PG, Gdańsk 1970; 3. Miłosz Frąckowiak: Statyka okrętu, Skrypt PG, Gdańsk 1990; 4. Jerzy Kabaciński: Stateczność i niezatapialność statku, Skrypt WSM w Szczecinie, Szczecin 1992; 5. Bertram V. Practical Ship Hydromechanics. Butterworth-Heinemann, 2004. 6. Dudziak J. Prognozowanie zdarzeń rzadkich związanych z zachowaniem się statku na wzburzonym morzu. Jednodniowa Sesja Okolicznościowa: Współczesne Problemy Hydromechaniki Okrętowej, Gdańsk, 14 kwietnia 1997. Zeszyty Problemowe Centrum Techniki Okrętowej, Rok XIX, Nr B-073, Gdańsk, czerwiec 1997. 7. Dudziak J. Teoria okrętu. Wydawnictwo Morskie, Gdańsk 1988. 8. Dudziak J. Teoria okrętu. Fundacja Promocji Przemysłu Okrętowego i Gospodarki Morskiej, Gdańsk 2008. 9. Faltinsen O.M. Sea Loads on Ships and Offshore Structures. Cambridge University Press, 1990. 10. Kobyliński L.K., Kastner S. Stability and Safety of Ships, Volume I: Regulation and Operation. ELSEVIER, Amsterdam – Boston – Heidelberg – London – New York – Oxford – Paris – San Diego – San Francisco – Singapore - Sydney - Tokyo, 2003. 11. Krężelewski M. Hydromechanika ogólna i okrętowa, część I. Skrypt Politechniki Gdańskiej, Gdańsk 1977. 12. Krężelewski M. Hydromechanika ogólna i okrętowa, część II. Skrypt Politechniki Gdańskiej, Gdańsk 1982. 13. Gerigk M. Kompleksowa metoda oceny bezpieczeństwa statku w stanie uszkodzonym z uwzględnieniem analizy ryzyka. Monografia, 101, Politechnika Gdańska, 2010.
	Supplementary literature	Dudziak J. Prognozowanie zdarzeń rzadkich związanych z zachowaniem się statku na wzburzonym morzu. Jednodniowa Sesja Okolicznościowa: Współczesne Problemy Hydromechaniki Okrętowej, Gdańsk, 14 kwietnia 1997. Zeszyty Problemowe Centrum Techniki Okrętowej, Rok XIX, Nr B-073, Gdańsk, czerwiec 1997.
	eResources addresses	Adresy na platformie eNauczanie: Właściwości Morskie, (W/L), Oceanotechnika II st. , sem 02, zimowy 2023/2024 - Moodle ID: 33575 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33575
Example issues/ example questions/ tasks being completed	1) Hydrodynamics of ships and seakeeping? 2) General equations of ship motion? 3) Equations of ship motion in waves? 4) Unified model of hydrodynamics of ships and seakeeping?	
Work placement	Not applicable	