GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Risk and reliability of systems, PG_00064886						
Field of study	Naval Architecture and Offshore Structures						
Date of commencement of studies	February 2026		Academic year of realisation of subject	2025/2026			
Education level	second-cycle studies		Subject group	Obligatory subject group in the field of study 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	1		ECTS credits	4.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Division of Hydromechanics and Ship Design -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Jakub Montewka				
	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	30.0	0.0	60
	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	60		10.0	30.0	100	
Subject objectives	The objective of this course is to get the students acquainted with the foundations of risk analysis as a scientific discipline, along with the practical approaches to risk analysis as a task in a context of risk informed decision making process. The students will be acquainted with the Quantitative Risk Assessment (QRA), HazId tools, risk-informed decision making, human reliability analysis techniques (HRA), basic tools for QRA such as Bayesian Belief Network, Fault Tree or Event Tree.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving	The student is aware of the importance for the design process of the correct presentation of results obtained from risk analysis, proper communication accompanying the analysis of uncertainty and the importance of the process of verification and validation of the developed models.	[SK2] Assessment of progress of work
[K7_W11] interprets social, economic, legal (including industrial and intellectual property laws), and other non-technical aspects of engineering activities, and includes them into engineering practice	The student skillfully uses data resources necessary to conduct risk analysis and is able to refer to the appropriate source while respecting copyright.	[SW2] Assessment of knowledge contained in presentation
[K7_K12] is ready for fullfiling social commitement and initation of actions for public interest including entrepreneurial thinking and acting	Risk analysis is forward-looking, proactive, and can therefore be an action that initiates entrepreneurial thinking.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_U03] identifies and formulates task specifications in the scope of shipborne and offshore systems/ processes design, including non-standard problems also accounting for their non-technical aspects	The student knows the issues related to risk analysis. He is able to formulate a scientific problem related to risk analysis and propose its solution at a certain level of generality. The student is able to carry out a risk analysis for a simple anthropotechnic system.	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task

Subject contents

1. Teoretical foundations of risk analysis.

2. Quantitative risk analysis, Hazard identification.

3. Human Reliability Assessment techniques.

4. Bayesian Networks, Fault Tree, Event Tree.

5. Safety assessment methods.

Prerequisites and co-requisites

None

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project pass	51.0%	50.0%
Lecture test	51.0%	50.0%

Recommended reading

Basic literature

1. Aven T. "Quantitative risk assessment. The scientific platform". Cambridge, 2011.
2. Aven T., Risk assessment and risk management: Review of recent advances on their foundation, European Journal of Operational Research, Volume 253, Issue 1, 2016, Pages 1-13, https://doi.org/10.1016/j.ejor.2015.12.023
3. Goerlandt F., Montewka J., Maritime transportation risk analysis: Review and analysis in light of some foundational issues, Reliability Engineering & System Safety, Volume 138, 2015, Pages 115-134, https://doi.org/10.1016/j.ress.2015.01.025.
4. https://wwwcdn.imo.org/localresources/en/OurWork/HumanElement/Documents/MSC-MEPC.2-Circ.12-Rev.2%20-%20Revised%20Guidelines%20For%20Formal%20Safety%20Asse Making%20Proces...%20(Secretariat).pdf

Supplementary literature

1. Galavotti, M.C. The Interpretation of Probability: Still an Open Issue? Philosophies 2017, 2, 20. https://doi.org/10.3390/philosophies2030020
2. Aven T, The risk concepthistorical and recent development trends, Reliability Engineering & System Safety, Volume 99, 2012, Pages 33-44, https://doi.org/10.1016/j.ress.2011.11.006, http://c4tx.org/ctx/pub/fsa.pdf
3. Wróbel K., Montewka J., Kujala P., System-theoretic approach to safety of remotely-controlled merchant vessel, Ocean Engineering, Volume 152, 2018, Pages 334-345, https://doi.org/10.1016/j.oceaneng.2018.01.020.

eResources addresses

Example issues/ example questions/ tasks being completed	1. Definition of risk and scientific approaches to risk analysis. 2. Application of Bayesian Networks in the risk analysis process. 3. Risk analysis process - elements, data sources, methods and models.
Work placement	Not applicable

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