GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Reliability of structures, PG_00041525		
Field of study	Civil Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
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	2	Language of instruction	English
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Structural Mechanics Department -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marek Skowronek	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	0.0	0.0	0.0	45

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	45	5.0	25.0	75

Subject objectives

General information on uncertainty modelling in engineering analysis and design
Distinction of three levels of reliability assessment, their domain and relevant operational methods

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U03] can perform classic statical and dynamical analysis of rod structures stability (trusses, frames and ties), both statically determined and undetermined as well as surface structures (plates, membranes and shells)	The student performs numerical reliability assessment on a prescribed level	[SU1] Assessment of task fulfilment
[K7_U11] is able to plan and execute laboratory experiments to evaluate quality of construction materials and to determine strength of construction elements	The student recognizes the uncertainty origins in the process of engineering analysis and design	[SU1] Assessment of task fulfilment
[K7_U16] is able to estimate the technical condition of engineering object; can interpret the results of constructions and materials examination;	The student performs numerical reliability assessment on a prescribed level	[SU1] Assessment of task fulfilment
[K7_W16] knows methods of diagnostics of engineering objects, has knowledge about different kinds of defects in constructions and its reasons; knows means of fixing and reinforcing of constructions.	The student recognizes basic uncertainty sources decisive for structural reliability	[SW1] Assessment of factual knowledge
[K7_W04] has knowledge on advanced strength of materials, modeling and optimisation of materials and constructions; has knowledge of fundamentals of Finite Element Method and general nonlinear analysis of engineering constructions and systems	The student adjusts a relevant reliability assessment method to the specified engineering task	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Probability theory - preliminaries.
Probabilistic models for load and resistance variables. Basic definitions - reliability, failure probability.
Random modelling of load and resistance variables. Reliability of structural systems.
Levels of reliability methods – classification. Level I methods - application to standards and codes, partial safety factors.
Level II methods – safety indices.
Level III method - numerical procedures. Monte Carlo simulation, engineering examples.
Random load combination. Time-variant reliability analysis.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Structural mechanics, strength of materials, mathematics</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>tests</td><td>0.0%</td><td>90.0%</td></tr>
<tr><td>activity, presentations</td><td>0.0%</td><td>10.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Ang A. H-S., Tang W.H. Probability concepts in engineering. Wiley Chichester 2007
2. Hart G. Uncertainty analysis of loads and safety in structural engineering. Prentice Hall Englewood Cliffs 1982
3. Madsen H.O., Krenk S., Lind N.C. Methods of structural safety. Prentice Hall Englewood Cliffs 1986
4. Nowak A. Collins K. Reliability of structures. McGraw Hill New York 2000.</td></tr>
<tr><td>Supplementary literature</td><td>1. Augusti G., Baratta A., Casciati F. Probabilistic methods in structural engineering. Chapman & Hall, London 1984
2. Ditlevsen O., Madsen H. Structural reliability methods. Wiley Chichester 1996, www.mek/dtu.dk/staff.od/books.htm
3. Thoft-Christensen P., Baker M.J. Structural reliability theory and its applications. Springer Berlin 1982
4. Thoft-Christensen P., Murotsu Y. Application of structural system reliability theory. Springer Berlin 1986
5. Melchers R. Structural reliability Analysis and prediction. John Wiley Chichester 1999.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Three levels of reliability assessment, short description
Basic Monte Carlo simulation algorithm adjusted to engineering problems</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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