



Subject card

Subject name and code	Reliability of structures, PG_00041525						
Field of study	Civil Engineering						
Date of commencement of studies	October 2022		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				
	[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				
	[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				
	[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				
	[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				

Subject contents	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.		
Prerequisites and co-requisites	Structural mechanics, strength of materials, mathematics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	tests	0.0%	90.0%
	activity, presentations	0.0%	10.0%
Recommended reading	Basic literature	<ol style="list-style-type: none">1. Ang A. H-S., Tang W.H. Probability concepts in engineering. Wiley Chichester 20072. Hart G. Uncertainty analysis of loads and safety in structural engineering. Prentice Hall Englewood Cliffs 19823. Madsen H.O., Krenk S., Lind N.C. Methods of structural safety. Prentice Hall Englewood Cliffs 19864. Nowak A. Collins K. Reliability of structures. McGraw Hill New York 2000.	
	Supplementary literature	<ol style="list-style-type: none">1. Augusti G., Baratta A., Casciati F. Probabilistic methods in structural engineering. Chapman & Hall, London 19842. Ditlevsen O., Madsen H. Structural reliability methods. Wiley Chichester 1996, www.mek.dtu.dk/staff.od/books.htm3. Thoft-Christensen P., Baker M.J. Structural reliability theory and its applications. Springer Berlin 19824. Thoft-Christensen P., Murotsu Y. Application of structural system reliability theory. Springer Berlin 19865. Melchers R. Structural reliability Analysis and prediction. John Wiley Chichester 1999.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Three levels of reliability assessment, short description Basic Monte Carlo simulation algorithm adjusted to engineering problems		
Work placement	Not applicable		