



## Subject card

Subject name and code	Safety and risk analysis in technology , PG_00025522						
Field of study	Mathematics						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2025/2026		
Education level	first-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	3		Language of instruction		Polish		
Semester of study	5		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Probability Theory and Biomathematics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Magda Dettlaff				
	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	15.0	0.0	60
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie:						
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		5.0		60.0	125
Subject objectives	Introduction to basic mathematical problems related to risk and safety of the human activity, especially in technology. Developing and improving competences in building mathematical models of real objects, with application of probability and statistics.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_W03		The student is able to analyze the given model. Performs statistical tests, analyzes the results.		[SW1] Assessment of factual knowledge		
	K6_U12		The student carries out a project in the R environment, in which he analyzes the risk of a given model.		[SU2] Assessment of ability to analyse information		
	K6_K04		The student draws conclusions at each stage of the project based on the results of statistical tests.		[SK2] Assessment of progress of work		
	K6_U05		The student understands mathematical theorems and uses them to solve problems.		[SU4] Assessment of ability to use methods and tools		
	K6_K02		The student appreciates the importance of self-expanding knowledge. Performs exercises to consolidate knowledge by himself.		[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	Risk in historical perspective, basic notions and context. Risk management and business ethic (human factor). Elements of reliability theory. Modeling of random phenomenon. Revision of selected notions of probability and mathematical statistics. Laplacea transform. Characteristics of reliability, hazard fuction. Systems without replacement. Extremal statistics. Classical and dual risk processes. Mathematical risk measures.						
Prerequisites and co-requisites	Courses completed: Probability Theory term IV (MAT1013/1)						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Projects		33.0%		40.0%		
	Test		33.0%		30.0%		
	exam		33.0%		30.0%		

Recommended reading	Basic literature	<p>C.Klüppelberg, D.Straub, ... , Risk, Springer, 2014.</p> <p>T.Aven, U.Jensen, Stochastic Models in Reliability, Springer (1999), 2014.</p> <p>B.Kopociński, Zarys teorii odnowy i niezawodności, PWN, 1973.</p> <p>D.C.M.Dickson, Insurance Risk and Ruin, CUP, 2006.</p>
	Supplementary literature	<p>F.Jacob, Risk Estimation on High Frequency Financial Data, Springer, 2015.</p> <p>H.Mohanty, P.Bhuyan, D.Chenthati, Big Data, Springer, 2015.</p> <p>R.Wieczorkowski, R.Zieliński, Komputerowe generatory liczb losowych, WNT, 1997.</p> <p>M.Gągolewski, Programowanie w języku R, PWN, 2014.</p>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<p>On exercises students solve problems which are provided by the lecturer, while others give their comments and suggest improvements. Test/exam problems are based on mentioned lists and topics from lectures. To pass the subject a student has to work out two research projects and submit them on a fixed date.</p> <p>Find a hazard function. Evaluate mean residual time. Minimalize risk in proper maintenance machine parks.</p> <p>A component has TTF density given by <math>f(t)=kt^4e^{-5t}</math>, <math>t&gt;0</math>. Find: a) <math>k</math>, b) <math>R(t)</math>, c) <math>h(t)</math>, d) MTTF.</p> <p>Consider a process where the components are replaced at a set time <math>t_r</math>, or replaced at failure if it occurs before <math>t_r</math>. What is the mean life of a component of this type, in terms of the reliability?</p>	
Work placement	Not applicable	