Subject card

Subject name and code	Safety and risk analysis in technology , PG_00025522
Field of study	Mathematics

Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
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	mgr inż. Katarzyna Tessmer
	Teachers	mgr inż. Katarzyna Tessmer

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						

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 fucntion. 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	C.Klüppelberg, D.Straub, ... , Risk, Springer, 2014.
		T.Aven, U.Jensen, Stochastic Models in Reliability, Springer (1999), 2014.
		B.Kopociński, Zarys teorii odnowy i niezawodności, PWN, 1973.
		D.C.M.Dickson, Insurance Risk and Ruin, CUP, 2006.
	Supplementary literature	F.Jacob, Risk Estimation on High Frequency Financial Data, Springer, 2015.
		H.Mohanty, P.Bhuyan, D.Chenthati, Big Data, Springer, 2015.
		R.Wieczorkowski, R.Zieliński, Komputerowe generatory liczb losowych, WNT, 1997.
		M.Gągolewski, Programowanie w języku R, PWN, 2014.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	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.	
	Find a hazard function. Evaluate mean residual time. Minimalize risk in proper maintenance machine parks.	
	A component has TTF density given by $f(t)=kt^4e^{-5t}$, $t>0$. Find: a) k, b) $R(t)$, c) $h(t)$, d) MTTF.	
	Consider a process where the components are replaced at a set time t_r, or replaced at failure if it occurs before t_r. What is the maen life of a component of this type, in terms of the reliability?	
Work placement	Not applicable	