

## 。 GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

Subject name and code	Probabilistic Methods for Informatics, PG_00047664								
Field of study	Informatics								
Date of commencement of studies	October 2024		Academic year of realisation of subject			2025/2026			
Education level	first-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			Polish			
Semester of study	4		ECTS credits			4.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Department of Computer Communications -> Faculty of Electronics, Telecommunications and Informatics								
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jerzy Konorski							
	Teachers	dr hab. inż. Jerzy Konorski							
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Project		Seminar	SUM	
of instruction	Number of study hours	30.0	15.0	15.0	0.0		0.0	60	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity	Participation in classes includ plan	n didactic led in study	Participation in consultation hours		Self-study		SUM	
	Number of study hours	60		5.0		35.0		100	
Subject objectives	Building the knowledge and skills necessary for application of probability and mathematical statistics to selected problems arising in informatics.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment		Student can evaluate the impact of selected parameters of stochastic systems on their expected functionality.			[SU4] Assessment of ability to use methods and tools			
	knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn [K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study		methods to moderately complex problems of modeling and analysis of IT systems Student understands probabilities of random events and distributions of random variables, understands the importance of randomness in the models of contemporary IT systems, as well as suitable analytical methods			Ise methods and tools			

Subject contents	1. Introduction, probabilistic paradoxes; probabilistic methods as an instrument of cognitive processes;							
-	review of basic notions and results of probability theory							
	2. From a modeling of content replication in networked structures, cooling systems, multiple access, Bloom filters, data fusion, distributed algorithms; applications of event calculus, conditional and total							
	probability, maximum likelihood, Bayes' rule.							
	3. Probabilistic modeling of social networks, concurrent processes, sorting mechanisms, system							
	defense mechanisms against ne	m variables, popular probability						
	distributions, moments and quar							
	4. Probabilistic analysis of complex decision mechanisms in LL systems: termination policy, software testing, risk analysis, reputation systems.							
	5 Applications of transformed random variables: pseudorandom number dependion with arbitrary							
	probability distributions, elements of data analysis.							
	6. Practice of sums of iid random variables, convolution of distributions, application of characteristic and							
	generating functions, random sums: access arbitration in multicore architectures, load balancing,							
	population dynamics analysis applied to stack queueing.							
	7. Weak law of large numbers and central limit theorem, application to prediction of web server workload,							
	anomaly detection, fitting probability distribution to empirical data.							
	o. Analysis of distribution tails, elements of large deviations theory: assessment of holsy signal deviation, reliability of networked elements, risk of violation of real-time constraints.							
	9. Application of Markov chains to modeling of text sources, error bursts, gueue state evolution. PageRank							
	workings, speech recognition.							
	10. Random vectors, correlation and regression models: applications to variance reduction in Monte Carlo							
	simulation, lossy image compression, optimal linear prediction.							
	11. Elements of statistical data analysis and validation of experimental data, estimators, construction of							
	contidence and tolerance intervals.							
	non-functional requirements in computer systems.							
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Prerequisites	none							
and co-requisites								
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade					
	Midterm colloquia	50.0%	30.0%					
	Final test covering lecture material	50.0%	40.0%					
	Lab exercixes	50.0%	30.0%					
Recommended reading	Basic literature	W. Sobczak, J. Konorski, J. Kozłowska: Probabilistyka stosowana,						
i toconinionacu rodanig	Wyd. PG 2004							
	W. Krysicki i in.: Rachunek prawdopodobieństwa i statystyka							
	matematyczna w zadaniach, PWN Warszawa 1997							
	Supplementary literature	W. Feller: Wstęp do rachunku prawdopodobieństwa, t. l, tłum. pol. PWN Warszawa 1980						
	eResources addresses	Adresy na platformie eNauczanie:						
Example issues/								
example questions/								
tasks being completed								
Work placement	Not applicable							
work placement								

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