GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Random Processes, PG_00048303		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Teleinformation Networks -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Bartosz Czaplewski	
	Teachers	dr inż. Bartosz Czaplewski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30
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	30	4.0	16.0	50

Subject objectives

Knowledge of basic properties of random processes and obtaining skills of computing and analysing of random processes characteristics.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] Knows and understands, to an increased extent, mathematics to the extent necessary to formulate and solve complex issues related to the field of study.	The student knows basic kinds and properties of random processes	[SW1] Assessment of factual knowledge
[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by:n- appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation,n- application of appropriate methods and toolsn	Student identifies, classifies and describes basic types of random processes, analyses their properties, calculates parameters and characteristics of random processes.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents	1.Random vectors Definition of a random vector Cumulative distribution function of a random vector Probability mass function of a random vector Probability density function of a random vector Joint cumulative distribution and joint probability density functions Marginal cumulative distribution and marginal probability density functions Conditional cumulative distribution and conditional prob. density functions Complex random vectors 2.Statistical moments of random vectors Estimator The mean value of the random vector Autocorrelation matrix and cross-correlation matrix Autocovariance matrix and cross-covariance matrix Conditional mean value of a random vector 3.Central Limit Theorem (Lindberg-Levy) 4.Estimation of statistical moments of random vectors 5.Multivariate Gaussian distribution 6.Linear transformations of random vectors 7.Diagonalization of autocorrelation matrices and autocovariance matrices 8.Random processes Definition of a random process Classification of random processes Cumulative distribution function of a random process Probability density distribution of a random process Conditional probability density distributions of random processes Independence of random processes 9.Statistical moments of random processes The mean value function of a random process Autocorrelation function of a random process Autocovariance function of a random process Cross-correlation function of random processes Cross-covariance function of random processes Properties of correlation and covariance functions 10.Stationarity of random processes 11.Ergodicity of random processes 12.Bernoulli random process 13.Binomial process 14.The random walk process 15.Wiener random process 16.Gaussian (Normal) random processes 17.Markov random processes 18.Markov chains 19.Hidden Markov model 20.The martingales and absolutely fair processes 21.Periodic random processes 22.Description of random processes in the frequency domain Power spectral density Cross power spectral density Sampling theorem for random processes White noise

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">No requirements</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Midterm colloquium</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">A. Papoulis, Probability, Random Variables, and Stochastic Processes, McGraw-Hill, 1991 Therrien, C. W. Discrete Random Signals and Statistical Signal Processing. Prentice-Hall, 1992. Hwei P. Hsu, Theory and Problems of Probability, Random Variables and Random Processes, McGraw-Hill, 1997.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">No requirements</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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