GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical statistics, PG_00045298						
Field of study	Data Engineering						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2023/2024		
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		English		
Semester of study	3		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Faculty of Management and Economics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Karol Flisikowski				
	Teachers		dr inż. Karol Flisikowski				

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	15.0	0.0	0.0	75
	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	75	8.0	17.0	100

Subject objectives	Main aim of the course is to teach students the basic concepts of probability and their application in mathematical modeling. After the course students will be able to perform the procedure of testing of statistical hypotheses (parametric and nonparametric) using R and R-studio environment.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W08] Knows the models and structure of the data mining process and their multidimensional analysis and can assess the results of such analyses	A student knows the basic linear and nonlinear models and time series models and is able to implement them to visualize the multiple analyzed relations.	[SW1] Assessment of factual knowledge
	[K6_K01] is aware of quickly changing trends and the resulting need for further education and self-improvement in the area of the performed profession of an engineer with IT and economic-financial skills.	A student is aware of the limitations of his knowledge and skills of using tools of mathematical statistics designed for research purposes. A student is aware of the role played by other quantitative methods in the study of socio-economic phenomena.	[SK3] Assessment of ability to organize work [SK2] Assessment of progress of work
	[K6_U11] is able to use mathematical and IT tools in economics.	A student, on the basis of knowledge infer regarding the real statistical problems. A student can use appropriate inferencial statistical analysis.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents	Probability space: the classic scheme, drawing with replacement and without replacement. Geometric Probability. Conditional probability, total probability, Bayes' formula. Independence of events.
	Discrete random variable: probability distribution function and cumulative distribution. A review of selected distributions of discrete random variables: the distribution of single-point, two-point, Binomial, Poisson. Continuous random variable: probability density function and cumulative distribution. A review of selected distributions of continuous random variables: uniform distribution, exponential, normal, chi-square, Student's t. The basic numerical characteristics of discrete and continuous random variables.
	Population and sample; Sampling schemes; the sample distributions. Basic statistics and their distributions; Estimators and their properties; Methods of obtaining estimators; Point estimation; Interval estimation; Testing of statistical hypotheses; The level of significance and power of the test; Parametric tests for one-dimensional population. Parametric tests for two-dimensional population. Tests for multidimensional population. Analysis of variance. Nonparametric tests; Normality tests; Test of independence (chi-square test); Tests of randomness. Sign tests. Tests for outliers; Tests used in the analysis of correlation and regression.

Prerequisites and co-requisites	Mathematics, descriptive statistics.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final test (laboratory)	60.0%	33.0%
	Final test (seminar)	60.0%	33.0%
	Final exam (lecture)	60.0%	34.0%

Recommended reading	Basic literature	
		1. McClave J. T., Benson P. G., Sincich T. (2008), Statistics for Business and Economics, Pearson/Prentice Hall. 2. Aczel A. D. (1989), Complete Business Statistics, Irwin. 3. Chihara L. M., Hesterberg T. C. (2011), Mathematical Statistics with Resampling and R, Wiley.
	Supplementary literature	1. Discovering statistics using R, Andy Field, Jeremy Miles, Zoe Field, Sage, 2012. 2. G. Jay Kerns, Introduction to Probability and Statistics using R, Third Edition, 2018.
	eResources addresses	Adresy na platformie eNauczanie: Mathematical Statistics (2023/24) - Moodle ID: 30296 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30296

Example issues/ example questions/ tasks being completed	1. Theoretical and empirical probability distribution and central limit theorem.
	2. Point and interval estimation, precision of the estimator, the minimum sample size required to obtain a specific precision.
	3. Parametric and nonparametric hypothesis testing.
	The final exam will test your knowledge of all the course material taught in the entire course.

Work placement	Not applicable