



## 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	Department of Economic Sciences -> 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.			[SK2] Assessment of progress of work [SK3] Assessment of ability to organize 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 inferential statistical analysis.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information	

Subject contents	<p>Probability space: the classic scheme, drawing with replacement and without replacement. Geometric Probability. Conditional probability, total probability, Bayes' formula. Independence of events.</p> <p>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.</p> <p>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.</p>														
Prerequisites and co-requisites	Mathematics, descriptive statistics.														
Assessment methods and criteria	<table border="1" data-bbox="448 636 1487 779"> <thead> <tr> <th data-bbox="448 636 794 674">Subject passing criteria</th> <th data-bbox="794 636 1141 674">Passing threshold</th> <th data-bbox="1141 636 1487 674">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 674 794 707">Final exam (lecture)</td> <td data-bbox="794 674 1141 707">60.0%</td> <td data-bbox="1141 674 1487 707">40.0%</td> </tr> <tr> <td data-bbox="448 707 794 741">Final test (seminar)</td> <td data-bbox="794 707 1141 741">60.0%</td> <td data-bbox="1141 707 1487 741">30.0%</td> </tr> <tr> <td data-bbox="448 741 794 779">Final test (laboratory)</td> <td data-bbox="794 741 1141 779">60.0%</td> <td data-bbox="1141 741 1487 779">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Final exam (lecture)	60.0%	40.0%	Final test (seminar)	60.0%	30.0%	Final test (laboratory)	60.0%	30.0%
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Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. McClave J. T., Benson P. G., Sincich T. (2008), Statistics for Business and Economics, Pearson/Prentice Hall.</li> <li>2. Aczel A. D. (1989), Complete Business Statistics, Irwin.</li> <li>3. Chihara L. M., Hesterberg T. C. (2011), Mathematical Statistics with Resampling and R, Wiley.</li> </ol>													
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Discovering statistics using R, Andy Field, Jeremy Miles, Zoe Field, Sage, 2012.</li> <li>2. G. Jay Kerns, Introduction to Probability and Statistics using R, Third Edition, 2018.</li> </ol>													
	eResources addresses														
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Theoretical and empirical probability distribution and central limit theorem.</li> <li>2. Point and interval estimation, precision of the estimator, the minimum sample size required to obtain a specific precision.</li> <li>3. Parametric and nonparametric hypothesis testing.</li> </ol> <p>The final exam will test your knowledge of all the course material taught in the entire course.</p>														
Work placement	Not applicable														