



Subject card

Subject name and code	Mathematical Statistics, PG_00062082						
Field of study	Mathematics						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	second-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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Równań Różniczkowych i Zastosowań Matematyki -> Instytut Matematyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Maryna Shcholokova				
	Teachers		dr Maryna Shcholokova				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	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		0.0		0.0	60
Subject objectives	Equipping the student with specialized mathematical equipment supporting technical subjects related to mathematical modeling, data analysis and applications of statistics.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W02] Has good understanding of the role and importance of mathematical reasoning structure.		The student recognizes statistical tests and distributions of statistics. The student knows the Rao-Blackwell theorem, theorem of factorization, Neyman-Pearson theorem, Cramer-Rao inequality.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
[K7_U08] Knows probability distributions and their properties; is able to use them in practical issues, is familiar with the basics of statistics (estimation issues and hypothesis testing) and the basics of statistical data processing.		The student recognizes the distribution of statistics. Identifies sufficient statistics. Constructs unbiased estimators of minimum variance using the Rao-Blackwell theorem, determined by the least squares method and the maximum likelihood method.		[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment			
Subject contents	Statistical space, simple random sample, statistics. Empirical distribution function and the fundamental theorem of statistics. Positional statistics, sample quantiles. Sufficient statistics, factorization criterion. Complete statistics. Estimators and minimum variance estimators (ENMW). Rao-Balckwell theorems, determination (ENMW). Cramer-Rao inequality. Methods for determining estimators. Ordinary least squares method (EMNK), Gauss-Markov linear model. Introduction to statistical hypothesis verification. Variance analysis.						
Prerequisites and co-requisites	Probability theory, measurement theory, mathematical analysis.						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
			0.0%		10.0%		
			51.0%		45.0%		
			51.0%		45.0%		

Recommended reading	Basic literature	<p>1. W. Kordecki, <i>Rachunek prawdopodobieństwa i statystyka matematyczna. Definicje, twierdzenia, wzory.</i></p> <p>2. H. Jasiulewicz, W. Kordecki, <i>Rachunek prawdopodobieństwa i statystyka matematyczna. Przykłady i zadania.</i></p> <p>3. I. Bąk, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak, <i>Statystyka w zadaniach. Część 1. Statystyka opisowa.</i></p> <p>4. I. Bąk, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak, <i>Statystyka w zadaniach. Część 2. Statystyka matematyczna.</i></p> <p>5. W. Kryszicki, J. Dyczka, K. Królikowska, M. Wasilewski, <i>Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach. Część 2. Statystyka matematyczna.</i></p> <p>6. A. Jokiel-Rokita, R. Magiera, <i>Modele i metody statystyki matematycznej w zadaniach.</i></p> <p>7. W. Regel, <i>101 zadań ze statystyki matematycznej z pełnymi rozwiązaniami.</i></p>
	Supplementary literature	C. Radhakrishna Rao, <i>Statystyka i prawda.</i>
	eResources addresses	<p>Podstawowe</p> <p>https://bdl.stat.gov.pl/bdl/pomoc -</p> <p>Adresy na platformie eNauczanie:</p> <p>Statystyka matematyczna - Moodle ID: 34045</p> <p>https://enauzanie.pg.edu.pl/moodle/course/view.php?id=34045</p>
Example issues/ example questions/ tasks being completed	<p>1. Determine the 95% realization of the interval for the average value and variance of the length distribution of wool fiber batches based on the data....</p> <p>2. Of the batch of bottles delivered to the dairy, 900 bottles were checked and 18 defective bottles were found. At the significance level = 0.05, verify the hypothesis that the percentage of rejected bottles is equal to = 3%, against the alternative hypothesis $K: > 3\%$.</p> <p>3. Using the data grouped in the correlation table, determine for each of the features X and Y: mean, variance, standard deviation and covariance, correlation coefficient, regression line equations and the angle between them.</p>	
Work placement	Not applicable	