



Subject card

Subject name and code	Mathematical Statistics, PG_00021039						
Field of study	Mathematics						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2022/2023		
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			4.0		
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 Agata Gołaszewska				
	Teachers		dr Agata Gołaszewska				
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		5.0		35.0	100
Subject objectives	Develop technical skills in probability modeling and statistical inference for the practical application of statistical methods in students future education and professional career (applied statistics, data science).						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_U09		Students are able to frame problems using multiple mathematical and statistical frameworks and solve problems using standard techniques and theorems.		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	K7_W02		Student recognizes statistical tests and statistics distributions. Student knows the Rao-Blackwell theorem, theorem of factorization, Neyman-Pearson's theorem and Cramer-Rao inequality.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	K7_W01		Student knows the basic theorems of mathematical statistics, CLT and the law of large numbers.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	K7_U08		Student identifies exact distributions arising in statistics. Identifies sufficient statistics. Constructs unbiased estimators with minimum variance using the Rao-Blackwell theorem, the least squares method and the maximum likelihood estimators.		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
Subject contents	Sample space, statistical model, statistics; The concept of a statistical model. The empirical distribution function and the basic theorem of statistics. Position statistics, sample quantiles. Sufficient statistics, factorization criterion. Complete statistics. Estimators and Minimum Variance Estimators (ENMW). Rao-Balckwell theorems, determination (ENMW). Introduction to the method of determining estimators. Least Squares Method (EMNK), . Introduction to the verification of statistical hypotheses. Introduction to analysis of variance.						

Prerequisites and co-requisites	Probability theory, measure theory, mathematical analysis.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam on the content of the lecture with the possibility of exemption with a minimum grade of 4.5 from exercises	51.0%	50.0%
	Written reports from self-made statistical analyzes - the form of projects	51.0%	25.0%
	Subject to additional scoring: own work, active participation in classes	51.0%	5.0%
	Final colloquium	51.0%	20.0%
Recommended reading	Basic literature	<p>Krysicki, Bartos, Dyczka, Królikowska, Wasilewski, "Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, tom 2, Statystyka medyczna", PWN</p> <p>R. Zieliński, "Siedem wykładów wprowadzających do statystyki matematycznej"</p> <p>J. Bartoszewicz, "Wykłady ze statystyki matematycznej", PWN 1996</p> <p>M. Krzyśko, "Statystyka matematyczna", UAM Poznań 2008</p> <p>R. Magiera, Modele i metody statystyki matematycznej, Oficyna Wydawnicza GiS (2002)</p> <p>A. Jokił-Rokita, R. Magiera, "Modele i metody statystyki matematycznej w zadaniach", Oficyna Wydawnicza GIS, Wrocław 2005</p>	
	Supplementary literature	<p>J. R. Barra, "Fundamentals of Statistics",</p> <p>S.D. Silvey, "Statistical Inference", Chapman and Hall / CRC (1975) Petrie Aviva, Sabin Caroline, "Medical Statistics at a Glance", Wiley and Sons (2019) M. Górkiewicz, J. Kołacz, "Statystyka medyczna", Wydawnictwo UJ (2001) R. Pruim, Foundations and Applications of Statistics: An Introduction Using R, AMS (2011)</p>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Be able to define and indicate on examples the Statistical Model and to conduct and describe a thorough statistical analysis on a specific statistical model. State with evidence the Fundamental Theorem of Statistics. Provide the Factorization Criterion with proof. Discuss the construction of the ENMW. Be able to give Rao's theorem. Discuss the relationship between sufficient and complete statistics		
Work placement	Not applicable		