

Subject card

Subject name and code	Advanced Simulation Methods, PG_00178729						
Field of study	Informatics and Econometrics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study		
Mode of study	part-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		5.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Department of Statistics -> Faculty of Management -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Tomasz Jurkiewicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	16.0	0.0	16.0	0.0	0.0	32
	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	32		2.0		91.0	125
Subject objectives	To acquire in-depth knowledge and advanced skills in the use of computer simulation in solving research and practical problems. Gain practical skills in solving data gaps and assessing imputation quality through computer simulation.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[liEMU2_U02] Students can use conventional or innovative statistics, econometrics or informatics tools to analyze economic and social phenomena.		The student revises and adapts conventional or develops innovative statistical and IT tools and applies them to simulation analysis and analysis of data sets with gaps.		[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report [SU5] implementation of a problem task [SU6] demonstration of practical skills		
	[liEMU2_W06] The student possesses a structured understanding of the processes, methods, and tools necessary for the design, creation, development, and provision of suitable conditions for informatics, econometrics or statistics tools.		The student analyses the selection of computer simulation tools, explains the selection of methods for imputation of missing data, creates appropriate computer and statistical tools for imputation and computer simulation.		[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report [SW5] implementation of a problem task		

Subject contents	Concept and types of simulation. Genesis and need for computer simulation. Applicability of simulation methods - advantages and disadvantages of stochastic and deterministic simulation. Building a simulation model. Random number generators from uniform distributions: Assessing the quality of generators through statistical tests and control tasks. Methods for obtaining random numbers from arbitrary probability distributions. Examples of problem solving using computer simulation. Causes and sources of random and non-random errors in surveys, effects of data gaps on data quality. Analysis of the bias resulting from data gaps. The need to use additional data sources to improve the quality of estimates. Sources of additional data. Methods of dealing with data gaps - general idea of the imputation approach. Concept and objectives of imputation, basic methods of imputation. Advantages and disadvantages of univariate and multivariate imputation. The problem of variance estimation when imputation is present. Simulation evaluation of imputation quality.		
Prerequisites and co-requisites	Completed course in statistics, mathematical statistics, representational method, computational programming		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Term paper on imputation and simulation.	51.0%	100.0%
Recommended reading	Basic literature	C.E. Sarndal, S. Lundstrom, Estimation in Surveys with Nonresponse, Wiley.	
		N. T. Longford, Missing Data and Small-Area Estimation, Springer	
		Wieczorkowski R. Zieliński R., Computer Generators of Random Numbers, WNT, Warsaw	
		Gentle J. E., Random Number Generation and Monte Carlo Methods, Springer	
	Supplementary literature	M. L. Stein, Interpolation of Spatial Data, Springer	
		A. Barbu , Song-Chun Zhu, Monte Carlo Methods, Springer	
		Johnson M. E., Multivariate Statistical Simulation, Wiley	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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