

Subject card

Subject name and code	Mathematical modelling, PG_00143988						
Field of study	Informatics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2025/2026		
Education level	Bachelor's studies	Subject group			Obligatory subject group in the field of study		
Mode of study	full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish polish		
Semester of study	3	ECTS credits			4.0		
Learning profile	practical	Assessment form					
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Joanna Czarnowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	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		40.0	100
Subject objectives	To introduce students to selected methods of mathematical modeling, particularly probabilistic methods that serve as an introduction to machine learning, as well as selected numerical algorithms.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[INFL3_U01] can apply mathematical knowledge to formulate, analyse and solve tasks related to computer science, design and analyze algorithms in terms of their correctness and computational complexity		The student is able to apply mathematical knowledge to model a practical data analysis problem, including parameter estimation and fitting of probability distributions. They can select appropriate tools and critically assess the quality of the results.		[SU2] presentation/project/paper/report		
	[INFL3_U04] can create, run and test programs using dedicated tools and design patterns		Is able to implement and test a simple statistical or probabilistic model (e.g., parameter estimation, linear regression) using computing environments		[SU2] presentation/project/paper/report		
	[INFL3_W02] has ordered, theoretically founded general knowledge in artificial intelligence, formal languages, numerical methods		Has general knowledge of probability theory as an introduction to machine learning, particularly covering: discrete and continuous distributions and regression models. Knows basic algorithms for interpolation and approximation.		[SW4] test/exam - oral or written		
	[INFL3_K02] can precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning		Is able to correct an incorrect or incomplete solution to a problem related to mathematical modeling.		[SK4] test/exam - oral or written		

Subject contents	<ol style="list-style-type: none"> 1. Discrete and continuous random variables and their parameters. Parameter estimation, model building, and testing. Bayesian inference. 2. Modeling multivariate dependencies - multivariate normal distribution. Examples of Monte Carlo approximations and bootstrap methods in modeling distributions and their parameters. 3. Selected interpolation and approximation methods, including the least squares problem. 4. Basics of regression. Model regularization. 		
Prerequisites and co-requisites	basics of algebra and mathematical analysis		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	40.0%
	laboratory	51.0%	60.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> • R.L. Burden, J.D. Faires, Numerical Analysis, Cengage Learning • K. P. Murphy, Machine Learning A Probabilistic Perspective, The MIT Press Cambridge • A modern approach to regression with R, Simon J. Sheather, Springer • Data Wrangling with R, Bradley C. Boehmke, Springer 	
	Supplementary literature	W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery, Numerical Recipes: The Art of Scientific Computing	
	eResources addresses		
Example issues/ example questions/ tasks being completed	not applicable		
Work placement	Not applicable		

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