University of Gdańsk

Subject card

Subject name and code	Mathematical Modelling, PG_00204165		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
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
Semester of study	3	ECTS credits	4.0
Learning profile	practical	Assessment form	exam
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 familiarize students with selected methods of mathematical modeling, in particular probabilistic methods that provide an introduction to machine learning, as well as selected numerical algorithms.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFPL3_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	Applies mathematical knowledge to model and analyze data, select appropriate tools, and evaluate the quality of the obtained results.	[SU2] presentation/project/paper/ report
[INFPL3_U04] is able to use the acquired knowledge when creating, running and testing programs using dedicated tools and design patterns	Uses computational environments to build, test, and evaluate mathematical models for data analysis.	[SU2] presentation/project/paper/ report
[INFPL3_K02] is ready to recognize the importance of knowledge in solving cognitive problems and practical and seeking opinions experts in case of difficulties with independent problem solving	Is prepared to critically assess the results and solutions obtained through mathematical modeling.	[SK2] presentation/project/paper/ report
[INFPL3_W02] knows and understands advanced concepts in artificial intelligence, formal languages, and numerical methods.	Knows and understands the fundamental principles of probability theory, regression, interpolation, and approximation applied in data modeling and numerical methods.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report

<table>
<tr><td>Subject contents</td><td>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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>basics of algebra and mathematical analysis</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>tasks on laboratory</td><td>51.0%</td><td>60.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>• R.L. Burden, J.D. Faires, Numerical Analysis, Cangag Learning
• M.A.Carlton, J.L.Devore, Probability with Applications in Engineering, Science, and Technology, Springer
• A modern approach to regresion with R, Simon J.Sheather, Springer
• Data Wrangling with R, Bradley C. Boehmke, Springer</td></tr>
<tr><td>Supplementary literature</td><td>• W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery, Numerical Recipes: The Art of Scientific Computing
• K. P. Murphy, Machine Learning A Probabilistic Perspective, The MIT Press Cambridge</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>not applicable</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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