



Subject card

Subject name and code	Statistics in action - we uncover the industrial secrets of data, PG_00069263						
Field of study	Chemistry						
Date of commencement of studies	February 2025		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Physical Chemistry -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Adam Kłoskowski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	45.0	0.0	0.0	45
	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	45		5.0		25.0	75
Subject objectives	The aim of the project classes is to equip the student with knowledge and practical skills related to the use of data to solve industrial problems. After completing the course, the student should be able to choose the right methodology and analyze the obtained results, including: - be able to map the process, define and determine the scope of the project and determine the data needed to solve the problem. - describe data using graphics and use interactive visualizations - know the tools that allow for quantifying process variability - draw conclusions from data, conduct hypothesis tests - be able to examine linear relationships between pairs of variables and fit and interpret linear and logistic regression models - know the concepts of design of experiments (DOE) and be able to design, conduct and analyze experiments						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_K101] acknowledges the importance of knowledge related to the field of study in solving cognitive and practical problems, critically assessing the information obtained		Student knows the importance of knowledge related to the field of study in solving cognitive and practical problems, critically evaluating the information obtained		[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice		
	[K7_U02] prepares detailed documentation of the results of independently conducted experiments and analyzes the obtained results, uses professional vocabulary with understanding and prepares and communicates information		The student prepares detailed documentation of the results of independently conducted experiments and analyzes the obtained results, uses professional vocabulary with understanding, and prepares and communicates information		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_W01] recognizes problems of modern chemistry, including properties and obtaining chemical compounds, necessary for making calculations, including the dependence of the compound's structure and its reactivity		The student recognizes the problems of modern chemistry, including the properties and preparation of chemical compounds, necessary to perform calculations, including the dependence of the compound's structure and its reactivity		[SW1] Assessment of factual knowledge		

Subject contents	During the course, the student will learn the theoretical foundations and tools for rational collection and analysis of data and planning of experiments aimed at optimizing technological processes. The course will be conducted in blocks covering the following stages of solving problems occurring in industry: 1) Statistical inference and problem solving: Overview of problem-solving methods: Defining the problem, Defining the process, Identifying potential root causes, Compiling and collecting data 2) Exploratory data analysis: Descriptive statistics, Probability concepts, Exploratory data analysis for solving problems 3) Qualitative/quantitative methods: Statistical process control, Process properties, Measurement system research 4) Data-based decision-making: Estimating statistical parameters, Testing hypotheses for continuous data, Basics of statistical testing, Sample size and power 5) Correlation and regression: Correlation, Simple linear regression, Multiple linear regression, Introduction to logistic regression 6) Design of experiments: Introduction to DOE, Factorial designs, Screening experiments, Response surface functions		
Prerequisites and co-requisites	Knowledge of the basics of statistics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		60.0%	100.0%
Recommended reading	Basic literature	M. Korzyński, Metodyka eksperymentu. Planowanie, realizacja i statystyczne opracowanie wyników eksperymentów technologicznych, WNT, 2017 G.E.P. Box, J.S. Hunter, W.G. Hunter, Statistics for Experimenters, 2nd Ed., Wiley Interscience, 2005	
	Supplementary literature	D.L. Massart, B.G.M. Vandeginste, S.M. Deming, Y. Michotte, L. Kaufman, Chemometrics: a textbook, Elsevier, 2003 R.G. Brereton, Applied Chemometrics for Scientists. J. Wiley & Sons, 2007	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1) Microbial Cultivation Process Optimization: This case study involves the use of Design of Experiments (DOE) to optimize a microbial culturing process. An optimal custom design is generated and evaluated for diagnostics, and a statistical model is fitted to the experimental data. The accuracy of the model and diagnostics must be analyzed, and optimal values for variables must be determined. 2) Polymerization Process: This case study involves the use of statistical methods to understand the process and improve its performance. One of the tasks is to identify the key factors affecting the molecular weight distribution. There are many process variables that affect this parameter. The goal is to understand the impact of these variables on the molecular weight variability.		
Work placement	Not applicable		

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