



Subject card

Subject name and code	Statistics and data analysis, PG_00069012						
Field of study	Cosmetic technologies						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	first-cycle 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		6.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Physical Chemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Marek Tobiszewski				
	Teachers		dr hab. inż. Marek Tobiszewski				
			dr hab. inż. Jarosław Wawer				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	20.0	20.0	0.0	0.0	60
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=7630						
	Moodle ID: 7630 STATYSTYKA I ANALIZA DANYCH TK zima 2026_27 https://enauczanie.pg.edu.pl/2025/course/view.php?id=7630						
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		85.0	150
Subject objectives	The aim of the course is to provide students with knowledge of fundamental statistical methods and tools, and to develop their ability to apply them in practice for data analysis and the interpretation of experimental results.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W06] recognizes technological and scientific possibilities and limitations, as well as organizational and economic ones, in cosmetics technology and related fields		has knowledge to recognize the possibilities and limitations of applying statistical methods and data analysis in research and technological processes related to cosmetic technology.		[SW1] Assessment of factual knowledge		
	[K6_W04] selects data analysis methods, including statistical, modeling and artificial intelligence, useful for solving technological and scientific problems in the field of cosmetic technology and related fields		knows the basic statistical methods and data analysis methods and understands the principles of their application in research and solving technological problems in cosmetic technology.		[SW1] Assessment of factual knowledge		

Subject contents	Course content – lecture		
	1. Introductory lecture – why do we need Statistics? Precision, accuracy, and types of errors. 2. Presentation of measurement results and estimation of uncertainty. 3. Descriptive statistics, population and statistical sample. Measures of central tendency and dispersion. 4. Histogram and normal distribution. The three-sigma rule. 5. Confidence interval. Does the sample meet the specification? Do the measurements give the same result? 6. Linear regression and the significance of the R ² parameter. 7. Graphs and data presentation. 8. Preparation of a dataset for chemometric analysis. 9. Cluster analysis. 10. Principal Component Analysis (PCA).		
	Course content – exercises		
	1. Basic statistical measures: mean (different types), median, skewness. 2. Measures of dispersion: SD, CV, RSD. Correct reporting of results. 3. Distributions, histograms, and confidence intervals. 4. Regression and correlation. R ² . 5. Statistical tests: Dixon's Q test. 6. Statistical tests: Student's t-test and Snedecor's F-test. 7. ANOVA. 8. Data standardization. 9. Cluster analysis and Principal Component Analysis (PCA).		
Prerequisites and co-requisites	Course content – laboratory		
	1. Rounding values. Python is simpler than you think. Estimation of uncertainty (Excel). 2. Python vs. Excel – which is better? Creating histograms. 3. Standard deviation: calculation and the effect of the number of measurements. Learning how to create graphs. 4. The simplest statistical test calculated directly from probabilities. Confidence interval. 5. Do the values differ? Comparison of an expected value with a specified value. 6. Performing linear regression and creating a graph. 7. Preparing data for chemometric analysis. 8. Cluster analysis. 9. Principal Component Analysis (PCA).		
	Basic knowledge of mathematics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture - written test	50.0%	40.0%
	Laboratory - written test	50.0%	30.0%
	Exercises - written test	50.0%	30.0%
Recommended reading	Basic literature	1) J.R. Tylor, "Wstęp do analizy błędu pomiarowego" PWN, Warszawa 2011 2) J. B. Czermiński, "Metody statystyczne dla chemików" PWN, Warszawa 1992 3) M. Sobczyk, "Statystyka" PWN, Warszawa 2012	
	Supplementary literature	1) P. Konieczka Ocena i kontrola jakości wyników analitycznych PG, Gdańsk 2004 2) J. Mazerski Podstawy chemometrii PG 2004 3) YouTube: Geek's Lesson, Statistics and Probability Full Course	
	eResources addresses		
Example issues/ example questions/ tasks being completed	How many digits to show in the measured result? How to estimate the measurement error? What is precision and what is accuracy? How does Excel calculate standard deviation? How to compare two values with each other?		
	The more parameters in the regression equation the better? What does R ² mean, the bigger R ² the better? What is the relationship between R ² and data linearity? How to assess the quality of the regression model?		
Practical activities within the subject	How to set the process parameters to obtain the highest possible reaction efficiency?		
	Not applicable		

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