GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Statistical processing of experimental data, PG_00057789		
Field of study	Green Technologies		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	Optional subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	English
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Agnieszka Pladzyk	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	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	50.0	100

Subject objectives

After a series of lectures and laboratories the student will:
Be able to use basic methods and tools of statistics.
Be able to apply the knowledge gained to analyse the results of experiments.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U03] is able to use information and communication technologies relevant to the common tasks of engineering, is able to use known methods and mathematical-physical models to describe and explain phenomena and chemical processes	is able to use ICT techniques and mathematical and physical methods to perform engineering tasks and describe chemical processes	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
[K6_W01] has a basic knowledge from some branches of mathematics and physics useful for formulating and solving simple problems in the field of environmental technologies and modern analytical methods	The knowledge gained in mathematics and physics combined with knowledge of statistics allows the student to analyse the data provided using tools from the field of computer science and (Python, Excel).	[SW1] Assessment of factual knowledge

Subject contents	Statistics - statistical analysis of a single variable - precision versus accuracy - absolute error, relative error, determination of errors of measuring instruments, error propagation method - sample and general population - measures of central tendency, measures of dispersion - histogram versus limiting distribution - Normal distribution, other types of distributions, parameters describing the distribution, skewness - standardisation of normal distributions, distribution - central limit theorem - confidence interval determination Statistical hypothesis verification: - types of errors, systematic errors, random errors, coarse errors - Type I and II error - general information on how to carry out statistical tests - statistical tests - examples, calculating the probability of a phenomenon taking place - Dixon's Q-test, F-Snedecor test, Student's T-test, other statistical tests. Data analysis - notions: interpolation, approximation, extrapolation - correlation and regression - construction of a mathematical model, regression - presentation of data on a graph - quality of the model fit and predictive ability - assessment of the quality of a mathematical model, significance and relevance of the model, assessment of linearity - significance of R2, Anscombe quartet - linearisation of functions - multiple regression Validation of the measurement method. Elements of experimental optimisation (in particular the drawback of the Gaussian method).
Prerequisites and co-requisites	basic knowledge from mathematics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
laboratory - test	50.0%	40.0%
lecture - test	50.0%	60.0%

Recommended reading

Basic literature	1) J.R. Tylor Wstęp do analizy błędu pomiarowego PWN, Warszawa 2011 2) https://statquest.org/ (autor: Josh Starmer, University of North Carolina at Chapel Hill, Department of Genetics) 3) YouTube: Geek's Lesson, Statistics and Probability Full Course 4) J. B. Czermiński Metody statystyczne dla chemików PWN, Warszawa 1992 5) 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
eResources addresses	Uzupełniające Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	How many digits to represent in the measured result? How do you estimate the measurement error? What is precision and what is accuracy? How does Excel calculate the standard deviation? How do you detect coarse error? How to compare two values with each other? The more parameters in a regression equation the better? What does the R2 coefficient mean, is the larger the R2 the better? What is the relationship between R2 and linearity of measured data? How do you assess the quality of a regression model? How to perform regression for non-linear relationships? How to set process parameters to get the highest possible response efficiency?
Work placement	Not applicable