GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemometry and Methodology of Experimental Research, PG_00058237		
Field of study	Biotechnology		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
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 Pharmaceutical Technology and Biochemistry -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Laskowski	
	Teachers	dr inż. Julia Borzyszkowska-Bukowska dr hab. inż. Tomasz Laskowski dr inż. Paweł Szczeblewski	

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	10.0	20.0	75

Subject objectives

The aim of this course is to familiarize Student with the methodological principles of experimental work, optimal experimental planning and data processing, using both statistical and chemometric approach.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W04] has a structured knowledge of the application of informatics tools in biotechnology and molecular modeling of biomolecules	A Student is familiar with the advanced statistical and chemometric methods and is able to properly choose a technique in respect to a given, scientific problem.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_K04] is aware of the need to solve problems and perform tasks, independently formulate questions to solve a given problem or task; is able to plan the execution of a larger task by dividing it into partial tasks and draw up an appropriate schedule	A Student is able to state a scientific problem and deal with it, using respective statistical and/or chemometric methods. In order to do that, a Student is able to properly select data from uncontrolled datasets or to plan the experiments with the respect to the art of the optimal experimental planning.	[SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work
[K7_U06] is able to apply statistical methods, computer solutions, especially bioinformatics methods to design experiments and technologies, analyze experimental results and technological processes and solve and technological processes and solve problems in the field of biotechnology, is able to use biotechnological databases	A Student is able to use a spreadsheet and Python/R programming languages in order to prepare respective tools, essential for the application of advanced data processing.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

Subject contents

1. Introduction to chemometrics and methodology of experimental work. Basics of both and the differences between statistical and chemometric approach.
2. Archivization and data control.
3. Analysis of single variables. Statistical probe vs. general population. Variables' distribution.
4. Graphical representation of the distributions. Histogram, quantum plot.
5. Statistical tests: outliers and errors.
6. Parametric and non-parametric comparison of general populations. Variance analysis.
7. Variables in pairs. Correlation & determination coefficients. Entropy of a distribution. Dependency linearization.
8. Introduction to chemometric approach: specific transformations of the variables.
9. Exploratory analysis: analysis of similarities. Distance matrices. Cluster analysis.
10. Exploratory analysis: factorial analysis. Information. Principal component analysis.
11. When chemometrics meets statistics: dependence modelling. Linear regression, statistical relevancy and quality of chemometric models.

Prerequisites and co-requisites

- Advanced usage of a spreadsheet.
- Basic Python programming.
- Basic statistics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
reports from laboratory classes	60.0%	40.0%
project	50.0%	20.0%
exam	60.0%	40.0%

Recommended reading

Basic literature	• Chemometria praktyczna, Jan Mazerski, Wydawnictwo Malamut. • Statystyczna analiza wyników doświadczalnych, Jan Mazerski, Wydawnictwo Politechniki Gdańskiej.
Supplementary literature	-
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

A Student has to prepare a dataset, state a problem for these data and solve the problem, using properly selected chemometric and statistical techniques.

Work placement

Not applicable