GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	METHODS OF EXPERIMENT PLANNING, PG_00064303
Field of study	Chemical Technology

Date of commencement of studies	February 2025	**Academic year of realisation of subject**	2024/2025
Education level	second-cycle studies	**Subject group**	Optional subject group Specialty 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	1	**ECTS credits**	1.0
Learning profile	general academic profile	**Assessment form**	assessment
Conducting unit	Department of Physical Chemistry -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Adam Kloskowski	
	Teachers	dr hab. inż. Adam Kloskowski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	15.0	0.0	15
	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	15	2.0	8.0	25

Subject objectives	The aim of the project classes is to equip the student with knowledge and skills in using rational techniques for optimizing the conditions for implementing analytical procedures and technological processes. After completing the course, the student should be able to select the appropriate methodology for designing experiments (DoE) and analyze the obtained results, including: - is able to select input factors in order to properly model the system - is able to design a series of experiments based on the selected methodology (factorial design, compositional designs, Placket-Burman designs, Box-Wilson method, Simplex optimization) - is able to analyze the obtained results using basic and advanced data analysis methods (correlation and regression analysis, basic multifactor statistical methods: such as cluster analysis (hierarchical and non-hierarchical), analysis and regression of principal components)

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U04] predicts the properties of the materials obtained and the course of processes involving them, based on knowledge of technology and related fields and computer methods of data analysis, modelling and simulation	The student is able to properly select the method for creating an experimental plan, both in terms of the number of planned experiments and the selection of input parameter values.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
	[K7_W03] selects methods of data analysis, including statistical and modelling, useful for solving scientific and technological problems	The student knows the theoretical basis of data analysis methods and experiment design.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[K7_U01] designs experiments using computer methods of data analysis, computer simulations and based on the state of the knowledge in accordance with the latest scientific literature	Based on the implemented experimental plan, the student is able to develop appropriate mathematical models and perform their critical analysis. The student is able to indicate the optimal conditions for conducting processes for which statistical models were obtained.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

Subject contents	During the classes, the student will learn the theoretical foundations and tools for rational planning of experiments aimed at optimizing analytical procedures and technological processes. The design issue will be the use of acquired knowledge and skills to solve a practical problem. The design classes will be carried out in two blocks: 1) discussion of the theoretical foundations of individual issues in the form of a presentation, combined with practical learning of the use of software dedicated to the discussed issue (MATLAB & Simulink). 2) Implementation of a design task whose aim will be to find optimal conditions for conducting a selected analytical procedure or technological process. The project will include the use of no less than two methods of creating experiment plans and will concern a problem requiring simultaneous optimization of no less than 4 input variables.		
Prerequisites and co-requisites	Knowledge of the basics of statistics and data analysis. Knowledge of the theoretical foundations of selected analytical techniques and technological processes.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		100.0%	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: atextbook, Elsevier, 2003	
		R.G. Brereton, Applied Chemometrics for Scientists. J. Wiley & Sons, 2007	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1) Based on available literature, determine the essential parameters for conducting the extraction process with the selected analytical technique. For a specific analyte-sample matrix system, develop an experiment plan. Based on the generated output data, perform a statistical analysis of the results and select the optimal conditions for conducting the extraction process 2) For the selected technological process requiring optimization of at least 4 parameters, propose an experiment plan. Based on the generated output data, perform a statistical analysis of the results and select the optimal conditions for conducting the extraction process.		
Work placement	Not applicable		

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