GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Planning of experiments, PG_00058346						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2025/2026			
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	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Piotr Jasiński				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30		5.0	40.0	75	
Subject objectives	The aim of the course is to familiarise students with the subject of Design of Experiments. The methods presented will enable better preparation for creative work, enabling the methodical construction of experiments on issues encountered in engineering work.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U03] can prepare and present a presentation on the problems and results of an engineering task	The student is able to present selected research findings in a systematic and critical manner, outlining the rigorous methodology adopted to carry out the research.	[SU5] Assessment of ability to present the results of task
	[K6_U01] Is able to obtain information from literature, databases and other sources, integrate them, interpret them and draw conclusions and formulate opinions; has the ability to self-educate m.in. in order to improve professional competences	Students will be able to critically review specialist literature on modern experimental design methods	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	[K6_U09] is able to use their knowledge in the field of programming methods and techniques and select and apply appropriate programming methods and tools in creating computer software or programming devices or controllers using microprocessors or programmable elements or systems, characteristic for a given field of study	The student is able to select an appropriate tool for the preparation of the planned experimental work	[SU4] Assessment of ability to use methods and tools
	[K6_K02] can work in a group taking on different roles in it	The student is able to fulfil specific roles in a group and is comfortable with group work, where separation of tasks and continuous supervision of duties is crucial.	[SK1] Assessment of group work skills
	[K6_W11] knows and understands mathematics at an advanced level to the extent necessary to formulate and solve simple issues related to the field of study	Students will understand the mathematical methods used in the analysis of experimental data, be able to critically analyse them and identify possible other methods	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	1. Introduction. Final objectives of the experiment: better understanding of the phenomenon, parameterestimation, prediction of system behaviour. 2. Non-linearity of systems with respect to parameters, with respect to excitation. Examples 3. Definitions of qualitative and quantitative experiment planning. 4. qualitative experiment planning. Structural traceability of systems. Example. 5. Methods and tools for qualitative experiment planning. Example. 6. quantitative experiment planning. The variables of an experiment. The importance of Fisher'sinformation matrix. 7. Experiment optimality criteria: D, A, C and Eoptimality. 8. Interpretation, practical significance and numerical complexity of the D, A, C and E-optimality criteria. 9. Application of quantitative experiment planning methods. Optimisation of the SP sampling scheme. 10. Application of quantitative experiment planning methods. Optimisation of the excitation u(t). 11. the OSSP scheme. Examples of SP optimisations. Experiment duration vs. distribution of optimalsamples. 12. optimisation of u(t). Ties and constraints. Interpretation. 13. UOPT scheme. Example optimisations. 14. effect of additional constraints on the excitation signal on the optimal solution 15. optimal organisation of the measurement process.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Final test	60.0%	100.0%

Recommended reading	Basic literature	1. Kalicka R. " Metody projektowania eksperymentu", 2010. 2. Khoo M., Physiological control systems, analysis, simulation,estimation, IEEE Press 2002. 3. Kalaba R., Springarn K., Control, identification and inputoptimization, Mathematical Concepts and Methodes in Scienceand Engineering, Vol. 25, Plenum Press, 1992. 4. Brown R.F.; Biomedical Systems Analysis, University of NewSouth Wales, Abacus Press, 1995
	Supplementary literature	1. Design of Experiments for Engineers and Scientists, Jiju Anthony Elsevier, 2014 2. Design of Experiments: A Modern Approach, 1st Edition, BradleyJones, Douglas C. Montgomery, Wiley, 2019

	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Please describe the Design of Experiments methodology. 2. Please explain the OVAT method - one variable at a time	
Work placement	Not applicable	

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