GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Methods of Experiment Design, PG_00049346		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Optional subject group 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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Sebastian Molin	
	Teachers	dr hab. inż. Sebastian Molin	

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	2.0	18.0	50

Subject objectives

The aim of the course is to familiarize students with methods allowing for optimal design of the experiment.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] can perform tasks related to the field of study in an innovative way as well as solve complex and nontypical problems, applying knowledge of physics, in changing and not fully predictable conditions	The student know how to plan experiments using advanced methods and understands the tools and methodologies.	[SU4] Assessment of ability to use methods and tools
[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	The student can use mathematics/ statistic tools and can present the data in a rigorous way.	[SW2] Assessment of knowledge contained in presentation

Subject contents

1. Introduction. The final goals of the experiment: a better understanding of the phenomenon, parameter estimation, prediction of system behavior. 2. Nonlinearity parameters of the system, the arousal. Examples 3. Definitions of qualitative and quantitative planning of the experiment. 4. Quality planning experiment. Structural traceability systems. Example. 5. Methods and tools for qualitative planning of the experiment. Example. 6. Quantitative planning of the experiment. The variables of the experiment. The importance of the Fisher information matrix. 7. Optimality criteria of the experiment: D, A, C and E-optimality. 8. Interpretation, practical importance and complexity of the numerical criteria for D, A, C, and E-optimality. 9. The use of quantitative methods for experiment planning. Optimization of sampling scheme SP. 10. The use of quantitative methods for experiment planning. Optimization of excitation u (t). 11. OSSP program. Sample optimization SP. The duration of the experiment and the optimal distribution of samples. 12. Optimization of u (t). Ties and limitations. Interpretation. 13. UOPT Program. Examples of optimizations. 14. Impact of additional constraints in enhancing the signal to an optimal solution 15. The optimal organization of the measurement process

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	50.0%	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 input optimization, Mathematical Concepts and Methodes in Science and Engineering, Vol. 25, Plenum Press, 1992. 4 Brown R.F.; Biomedical Systems Analysis, University of New South Wales, Abacus Press, 1995
	Supplementary literature	1. Semlow J., Circuits, signals and systems for bioengineering, Elsevier Academic Press, 2005
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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