GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Methods of Experiment Design, PG_00057505		
Field of study	Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	February 2022	Academic year of realisation of subject	2021/2022
Education level	second-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	1	Language of instruction	English
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Dąbrowski	
	Teachers	dr inż. Paweł Dąbrowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	15.0	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	7.0	13.0	50

Subject objectives

The subject aims to familiarize students with the idea of experimental work, from planning the experiment, through the acquisition and interpretation of measurement data, to drawing conclusions based on them. In addition, the subject aims to familiarize students with the importance of measurement uncertainty in experimental research as well as to show good practices in conducting experimental work. This subject will teach the student how to plan and run an experiment, and how to interpret the data and compare it with scientific theories, taking into account measurement uncertainty.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U82] is able to proficiently obtain and process information related to field of study and academic environment in foreign language at B2+ level of the Common European Framework of Reference for Languages (CEFR)	The ability to use professional literature in English concerning experiment design, experimental research, and data analysis in the field of energy sciences	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K7_K81] is able to cooperate in international team at her/his own university, during work placement and during study abroad	The ability to work in a small team in the field of experiment design and preparing and delivering a presentation in English	[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills
[K7_K82] is equipped to participate actively in lectures, seminars and laboratory classes conducted in foreign language	The ability to participate in lectures conducted in English and to deliver a presentation in English	[SK4] Assessment of communication skills, including language correctness
[K7_U81] is able to communicate with ease in foreign language at B2+ level of the Common European Framework of Reference for Languages (CEFR) in everyday life, in academic and professional environments	The ability to communicate fluently in English during lectures and seminars, both in everyday life and in the academic and professional environment	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
[K7_W05] knows basic methods, techniques and tools used in solving complex engineering tasks in the field of modeling of thermal-energy systems	The ability to design an experiment in the field of thermal-flow processes and theoretically elaborate the results, using a variety of techniques and tools, including the calculation of measurement uncertainty	[SW2] Assessment of knowledge contained in presentation
[K7_W81] has knowledge of complex grammatical structures and diverse lexical resources needed to communicate in foreign language in terms of general and specialist language related to field of study	The ability to use extensive grammatical structures and various lexical fields passively during participation in lectures and in an active manner during a presentation on experiment design in the field of energy sciences	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation

Subject contents

1. Basic concepts
2. Experiment in historical and philosophical perspective
3. Examples of simple experiments
4. Basics of experiment design
5. Input, output, control, dependent, and independent variables
6. Qualitative and quantitative measurements
7. Uncertainties and measurement errors
8. Acquisition of measurement data
9. Statistical analysis of measurement data
10. Utilization of measurement data for calculations
11. Numerical methods as an experiment aiding tools
12. Good practices in designing and conducting experimental research
13. Designing and conducting an experiment - a case study
14. Presentation of the group work results

Prerequisites and co-requisites

The knowledge of basic mathematical concepts with particular emphasis on the concepts of mathematical statistics. Basic knowledge in the field of thermal-flow measurements. Knowledge of English at a level that allows an oral presentation.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Seminar - presentation	60.0%	40.0%
Lecture - written test	60.0%	60.0%

Recommended reading

Basic literature	1. Montgomery D.C. Design and analysis of experiments. Eighth Edition. Wiley & Sons, 2013, ISBN: 978-1-118-14692-7
Supplementary literature	1. Abu-Mulaweh H. Integration a ddesign of experiment in the heat transfer laboratory. Annual Conference Proceedings, 2003, DOI: 10.18260/1-2--11948 2. Luiten W. Design of experiments in thermal architecture. 23rd International Workshop on Thermal Investigations of ICs and Systems (THERMINIC), 2017, DOI: 10.1109/THERMINIC.2017.8233785 3. Prima EC, Utari S, Chandra DT, Hasanah L, Rusdiana D. Heat and temperature experiment designs to support students conception on nature of science. Journal of Technology and Science Education, 2018, DOI: 10.3926/jotse.419
eResources addresses	

Example issues/ example questions/ tasks being completed	1. Definitions: experiment, input variable, output variable, control variable, dependent variable, independent variable, repeatability, sensitivity 2. Measurement uncertainty 3. Statistical analysis of measurement data 4. Differences between experimental and non-experimental research 5. False positive results 6. Double-blind design 7. Design an experiment to measure the emissivity of the body 8. Influence of various factors on the results of the experiment
Work placement	Not applicable