

SDAŃSK UNIVERSITY 的 OF TECHNOLOGY

Subject card

Subject name and code	Planning of experiments and error analysis, PG_00057374							
Field of study	Mechanical Engineering							
Date of commencement of studies	February 2024		Academic year of realisation of subject			2023/2024		
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			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	Subject supervisor prof. dr hab. inż. Dariusz Mikielewicz							
of lecturer (lecturers)	Teachers		mgr inż. Michał Pysz					
			Muhammad Saqib					
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Project		Seminar	SUM
of instruction	Number of study hours	15.0	15.0	0.0	0.0		0.0	30
	E-learning hours inclu	uded: 0.0						
Learning activity and number of study hours	Learning activity	Participation in classes includ plan	n didactic ed in study	Participation in consultation hours		Self-study SUM		
	Number of study hours	30		6.0		14.0		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_W07] possesses profound knowledge on the diagnostics and monitoring of the condition of devices, assemblies and technical systems, as well as measurement methods of process and operation control		The ability to design and carry out experimental work based on measurements of physical quantities and their curation, enabling diagnostics and monitoring of the machines and devices operation			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K7_W01] possesses a profound mathematical knowledge useful in the analysis and description of the operation of complex mechanical systems, technological processes and operating properties of machines and devices; is familiar with the main development trends		The ability to experimental data curation using mathematical and statistical analysis			[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
	[K7_U05] is able to plan and conduct the experimental research determining the parameters of a device or system, assesses the usability and correctly selects methods and tools, is able to interpret the results and estimate the measurement errors and is able to apply computer systems to simulate the operation of a machine or technology		The ability to design an experiment in the field of machinery and equipment or technology and theoretical results elaboration, using a variety of techniques and tools, including the calculation of measurement uncertainty			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	 Basic concepts Experiment in historical and philosophical perspective Examples of simple experiments Basics of experiment design Input, output, control, dependent, and independent variables Qualitative and quantitative measurements Uncertainties and measurement errors Acquisition of measurement data Statistical analysis of measurement data Utilization of measurement data for calculations Numerical methods as an experiment aiding tools Good practices in designing and conducting experimental research Designing and conducting an experiment - a case study 						
Prerequisites and co-requisites	Knowledge of basic mathematical concepts with particular emphasis on the concepts of mathematical statistics. Basic knowledge of machine construction, thermal-flow and material strength measurements.						
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	Tutorial - writing assessment	60.0%	40.0%				
	Lecture - writing assessment	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	 Abu-Mulaweh H. Integration a ddesign of experiment in the heat transfer laboratory. Annual Conference Proceedings, 2003, DOI: 10.18260/1-211948 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 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	Adresy na platformie eNauczanie:					
		Methods of Experiment Design - Moodle ID: 37040 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37040					
Example issues/ example questions/ tasks being completed	 Definitions: experiment, input variable, output variable, control variable, dependent variable, independent variable, repeatability, sensitivity Measurement uncertainty Statistical analysis of measurement data Differences between experimental and non-experimental research False positive results Double-blind design Design an experiment to measure the Young's modulus of the material Influence of various factors on the results of the experiment 						
Work placement	Not applicable						