

关。GDAŃSK UNIVERSITY 多 OF TECHNOLOGY

Subject card

Planning of experiments and error analysis, PG_00057365								
Mechanical Engineering								
February 2023		Academic year of realisation of subject			2022/2023			
second-cycle studies		Subject group			Obligatory subject group in the field of study Subject group related to scientific			
					research in the field of study			
Full-time studies					-	,		
1								
1								
general academic profile					assessment			
	Faculty of Med	-		o Techno	ology			
Subject supervisor		dr inż. Paweł Dąbrowski						
leachers	dr inż. Paweł Dąbrowski							
Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
Number of study hours	15.0	15.0	0.0	0.0		0.0	30	
-	ided: 0.0							
Learning activity			Participation in consultation hours		Self-study		SUM	
Number of study hours	30		6.0		14.0		50	
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.								
Course outcome		Subject outcome		Method of verification				
[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			[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge			
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 [K7_W07] possesses profound knowledge on the diagnostics and monitoring of the condition of devices, assemblies and technical systems, as well as measurement		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 The ability to design and carry out experimental work based on measurements of physical quantities and their curation, enabling diagnostics and			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge			
	Mechanical Engineeri February 2023 second-cycle studies Full-time studies 1 1 general academic proc Institute of Energy -> Subject supervisor Teachers Lesson type Number of study hours E-learning hours inclu Learning activity Number of study hours The subject aims to fa through the acquisitio addition, the subject a experimental research teach the student how scientific theories, tak Course outta [K7_W01] possesses mathematical knowled the analysis and desi operation of complex systems, technologic and operating proper machines and devices with the main develop [K7_U05] is able to p conduct the experime determining the para device or system, as usability and correctly methods and tools, is interpret the results a the measurement err able to apply computo machine or technolog [K7_W07] possesses knowledge on the dia monitoring of the com devices, assemblies systems, as well as r	Mechanical Engineering February 2023 second-cycle studies Second-cycle studies Full-time studies 1 general academic profile Institute of Energy -> Faculty of Mec Subject supervisor Teachers Lesson type Lecture Number of study hours 15.0 Participation in classes include plan Number of study hours 30 The subject aims to familiarize stude through the acquisition and interpret addition, the subject aims to familiar experimental research as well as to teach the student how to plan and ru scientific theories, taking into accour [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 [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 [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	Mechanical Engineering February 2023 Academic y realisation second-cycle studies Subject grownels second-cycle studies Subject grownels Full-time studies Mode of determining 1 ECTS cred general academic profile Assessmer Institute of Energy -> Faculty of Mechanical Engine Subject supervisor dr in2. Pawel Teachers dr in2. Pawel Lesson type Lecture Tutorial Number of study hours 15.0 15.0 E-learning hours included: 0.0 Learning activity Participation in didactic classes included in study plan Number of study hours 30 30 The subject aims to familiarize students with the idd through the acquisition and interpretation of measu addition, the subject aims to familiarize students wite experimental research as well as to show good prateat the student how to plan and run an experime scientific theories, taking into account measuremer Course outcome Subjection of the operation of complex mechanical systems, technological processes and operating properties of machines and devices; is familiarize students wite the ability to experiment al research advices; is familiarize students, we are aclculation of a machine or technology [K7_U05] is able to plan and coroduct the experimental research advices, assemble san	Mechanical Engineering February 2023 Academic year of realisation of subject second-cycle studies Subject group Full-time studies Mode of delivery 1 Language of instructio 1 ECTS credits general academic profile Assessment form Institute of Energy -> Faculty of Mechanical Engineering and Ship Subject supervisor dr in2. Pawel Dąbrowski Teachers dr in2. Pawel Dąbrowski Lesson type Lecture Tutorial Laboratory Number of study hours 15.0 0.0 0.0 Learning hours included: 0.0 E-learning hours included: 0.0 Consultation I Learning activity Participation in didactic classes included in study plan Participation or on measurement data, t addition, the subject aims to familiarize students with the idea of experiment data, t addition, the subject aims to familiarize students with the importa experimental research as well as to show good practices in conditeach the student how to plan and run an experiment, and how to scientific theories, taking into account measurement uncertainty. 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Pawel Dabrowski Teachers dr in2. Pawel Dabrowski Esson type Lecture Tutorial Laboratory Project Seminar Number of study 15.0 15.0 0.0 0.0 0.0 0.0 Number of study 30 6.0 14.0 14.0 Instruction having conclusions based dation, the subject aims to familiarize students with the idea of experimental work, from planning the through the acquisition and interpretation of measurement uncertainty. [SW2] Assessment or chaining a variety of technology and theoretical result is and scinge a variety of technology and theoretical result is and scinge a variety of technology and theoretical result is and scinding a variety of technology and theoretical result i	

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	 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: Planowanie Eksperymentu i Analiza Błędów, W, MiBM, sem.01, letni 22/23 (PG_00057365) - Moodle ID: 29155 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29155 Planowanie Eksperymentu i Analiza Błędów, W, MiBM, sem.01, letni 22/23 (PG_00057365) - Moodle ID: 29155 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29155				
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 emissivity of the body Design an experiment to measure the hardness of the material Design an experiment to measure the hardness of the material Influence of various factors on the results of the experiment 					
Work placement	Not applicable					