



Subject card

Subject name and code	Experiment design and analysis, PG_00061894						
Field of study	Materials Engineering						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Barbara Kościelka					
	Teachers	prof. dr hab. inż. Barbara Kościelka					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	30.0	0.0	0.0	60
	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	60	5.0	60.0	125		
Subject objectives	The aim of the course is to familiarize the student with basic information regarding the process of planning, performing and publishing experimental data.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U01] is able to analyse and solve complex and non-standard scientific and technical problems in materials engineering based on his knowledge, using appropriate analytical, computational, numerical, simulation, or experimental methods	The student is able to plan an experiment and conduct simple measurement experiments. Is able to correctly analyze the received measurement data			[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
	[K6_W06] has knowledge of the principles of experimental design, experimental methods, measurement techniques, and the tools and materials used in solving complex engineering problems in materials engineering.	The student is able to analyze a series of measurement data, present the results in the form of clear graphs, and analyze measurement uncertainties			[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation		
	[K6_U02] is able to independently or in cooperation with a team, design and construct simple devices, measuring instruments, or technical systems, using appropriately selected methods, techniques, tools, and materials	The student is able to plan an experiment and conduct simple measurement experiments. Is able to correctly analyze the received measurement data			[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task		

Subject contents	<p>Course content – lecture Lectures/exercises</p> <ol style="list-style-type: none"> 1. Sources of scientific and non-scientific knowledge. 2. Measurement errors and uncertainties. 3. Statistical distribution of measurements. 4. Measurements and measurement uncertainties of complex quantities. 5. Graphical and tabular presentation of measurement results. 6. Determination of physical parameters from graphs. 7. Linear regression method. Planning simple physical experiments. 8. Principles of presenting measurement results. Creating a report. 9. Principles of preparing scientific publications. <p>Laboratory</p> <ol style="list-style-type: none"> 1. Planning of experiments in the field of chemistry in accordance with the principles of green chemistry and BAT (best available technologies). 2. The Reach system as a determinant in planning chemical experiments and selecting raw materials for syntheses. 3. Methods of planning experiments and measurements of engineering materials, including methods of detecting errors in measurement techniques. 4. Quantitative analysis using spectrophotometry based on calibration curve, dependence of absorbance on concentration of standard substance, Lambert-Beer law. 5. Procedure for preparation of standard solutions, analysis of changes in conditions (e.g. temperature, batches of reagents), preparation of the work curve for each day of measurement. 6. Calculation of expected value based on arithmetic mean of results, standard deviation, and elimination of gross errors. 											
Prerequisites and co-requisites	Knowledge of mathematics at secondary school level											
Assessment methods and criteria	<table border="1" data-bbox="448 1912 1487 2058"> <thead> <tr> <th data-bbox="448 1912 798 1946">Subject passing criteria</th> <th data-bbox="798 1912 1141 1946">Passing threshold</th> <th data-bbox="1141 1912 1487 1946">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1946 798 2002">Laboratory - passing all laboratory exercises</td> <td data-bbox="798 1946 1141 2002">50.0%</td> <td data-bbox="1141 1946 1487 2002">50.0%</td> </tr> <tr> <td data-bbox="448 2002 798 2058">Lecture and exercises: written exam common to both parts</td> <td data-bbox="798 2002 1141 2058">50.0%</td> <td data-bbox="1141 2002 1487 2058">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory - passing all laboratory exercises	50.0%	50.0%	Lecture and exercises: written exam common to both parts	50.0%	50.0%
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Recommended reading	Basic literature	<p>Lecture/exercises</p> <ol style="list-style-type: none"> 1. B. Kusz, Metody wykonywania pomiarów oraz szacowanie niepewności pomiaru (https://pg.edu.pl/files/ftims/2021-03/wstep.pdf) 2. K. Kozłowski, R. Zieliński I Laboratorium z Fizyki część I Wydawnictwo PG. 3. Dudkiewicz J, Kusz B, Laboratorium z Fizyki, część 2, Wydawnictwo PG. 4. Wstęp do analizy błędu pomiarowego, Wydawnictwo PWN <p>Laboratory</p> <ol style="list-style-type: none"> 1. B. Burczyk, Zielona chemia. Zarys, Oficyna Wydawnicza Politechniki Wrocławskiej, 2014 2. Najlepsze Dostępne Techniki (BAT) Wytyczne dla Branży Chemicznej w Polsce (https://www.ekoportal.gov.pl/fileadmin/Ekoportal/Pozwolenia_zintegrowane/poradniki_branzowe/11.5_Systemy_Obrobki_Zarzadzania_Wodami_i_Gazami_Odpadowymi) 3. https://www.gov.pl/web/rozwoj-technologie/system-reach 4. Analiza statystyczna w laboratorium badawczym, PWN, Wojciech Hyk, Zbigniew Stojek
	Supplementary literature	-
	eResources addresses	

<p>Example issues/ example questions/ tasks being completed</p>	<p>Lecture/exercises</p> <ol style="list-style-type: none"> 1. Calculate the standard deviation for the given series of experimental data. 2. Provide the sources of measurement uncertainties. 3. Draw a line graph from the given data, calculate the slope of the line and the fit coefficient. <p>Laboratory</p> <ol style="list-style-type: none"> 1. Determination of a calibration curve taking into account all points for individual concentrations, with rejection of gross errors for various measuring devices: glass pipettes and measuring cylinders. 2. Preparation of detailed tables of results for individual students and the mean and standard deviation. 3. Calculation of SSE for parameters a and b, along with a description of the uncertainty for the result of a sample with an unknown concentration. 4. Application of the dilution method in the preparation of the standard curve, as well as the tested sample. 5. Determination of LOD and LOQ for the obtained curve. 6. Designing and making a simple research device and conducting an experiment. For example, measuring air temperature. 7. Taking a series of measurements and correlating the number of cars in a parking lot with the air temperature.
<p>Practical activities within the subject</p>	<p>Not applicable</p>

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