



## Subject card

Subject name and code	Introduction to experiment, PG_00027570						
Field of study	Nanotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2020/2021		
Education level	first-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			Polish		
Semester of study	2	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Bogusław Kusz					
	Teachers	prof. dr hab. inż. Bogusław Kusz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0 Adresy na platformie eNauczenie:						
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	1.0		19.0		50
Subject objectives	The goal of the lectures is to acquaint the students with basics of physical measurements methodology.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_K04	The student will have the ability to work in a team.			[SK1] Assessment of group work skills		
	K6_U04	The student will have the ability to conduct research and analyze the results.			[SU1] Assessment of task fulfilment		
	K6_U10	The student will learn about the positive and negative effects of nanotechnology on the environment.			[SU3] Assessment of ability to use knowledge gained from the subject		
	K6_W10	The student will have knowledge about planning the experiment.			[SW1] Assessment of factual knowledge		
Subject contents	During the course of classes the students get to know the notion of uncertainty: its nature, possible sources and types. At the same time they learn, how to properly write down measurements with uncertainty taken into account. Next they learn to calculate uncertainty of composite quantities using the complete differential method. Through the rest of semester the students learn the basics of statistical analysis: estimation of mean, standard deviation and standard deviation of the mean of a given random sample; the three sigma rule and Q Dixon test for rejection of outliers; T-Student test for comparison of means of two random samples and fitting a linear function to a data sample using the least squares fit.						
Prerequisites and co-requisites	Basic course of physics.						
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Written exam	51.0%			100.0%		
Recommended reading	Basic literature	1.Polański Z.,Planowanie doświadczeń w technice, PWN, Warszawa, 1984.					
	Supplementary literature	Internet					
	eResources addresses						

<p>Example issues/ example questions/ tasks being completed</p>	<p>1. Let <math>A</math> denote a set obtained by taking 6 random samples out of a larger set: <math>A = \{5, 4, 3, 5, 4, 6\}</math>, and let <math>B</math> denote a second set obtained similarly: <math>B = \{4, 4, 6, 5, 4, 5\}</math></p> <p>On the base of T-Student test check if the populations from which the two samples were taken are equal.</p> <p>2. The speed of railway carriage is <math>(5,0 \pm 0,2) \text{ m/s}</math>. Its mass: <math>m = (10 \pm 1) \text{ tons}</math>. To calculate kinetic energy of carriage.</p> <p>Perform uncertainty analysis of composite quantities <math>E</math> and present the final results according to established norms.</p>
<p>Work placement</p>	<p>Not applicable</p>