



Subject card

Subject name and code	Planning and analysis of experiment, PG_00060211						
Field of study	Technical Physics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
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	1	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Fizyki Zderzeń Elektronowych -> Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Paweł Możejko					
	Teachers	dr hab. Paweł Możejko prof. dr hab. Anna Perelomova					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	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	5.0		40.0	75	
Subject objectives	The aim of the course is to present the measurements procedures of physical quantities and the analysis of statistical and systematic uncertainties.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W08] has knowledge of planning and conducting physical experiments, and critical analysis of its results	Ability to calculate the experimental errors in indirect measurements.			[SW1] Assessment of factual knowledge		
	[K6_U04] plans and conduct experiments, critically analyzes their results, draw conclusions and forms opinions, has laboratory work experience	Practical knowledge of statistical distributions and their application in the error analysis.			[SU4] Assessment of ability to use methods and tools		

Subject contents	1.) Experimental results and their uncertainties (1 hr.) 2.) Propagation of uncertainties (1 hr.) 3.) Statistical analysis of random uncertainties (1 hr.) 4.) The normal distribution (1 hr.) 5.) The standard deviation, standard deviation of the mean and the normal distribution (1 hr.) 6.) Weighted averages (1 hr.) 7.) Least-squares fitting (1 hr.) 8.) The covariance and correlation (1 hr.) 9.) The binomial distribution, the Poisson distribution (1 hr.) 10.) χ^2 test (1 hr.) 11.) t-Student distribution (1 hour) 12.) Graphical presentation of the results of measurements (1 hr.) 13.) Basic measuring instruments (caliper, micrometer, etc..) (1 hr.) 14.) Measurements of the basic physical quantities (1 hr.) 15.) Planning of the experiment (1 hr.)											
Prerequisites and co-requisites	Knowledge and of the basic algebraic operations Knowledge of the basic elementary functions of one variable Ability to think analytically											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 1408 794 1438">Subject passing criteria</th> <th data-bbox="794 1408 1139 1438">Passing threshold</th> <th data-bbox="1139 1408 1482 1438">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1442 794 1471">Midterm colloquium</td> <td data-bbox="794 1442 1139 1471">60.0%</td> <td data-bbox="1139 1442 1482 1471">50.0%</td> </tr> <tr> <td data-bbox="453 1476 794 1505"></td> <td data-bbox="794 1476 1139 1505">60.0%</td> <td data-bbox="1139 1476 1482 1505">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquium	60.0%	50.0%		60.0%	50.0%
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Recommended reading	Basic literature Supplementary literature eResources addresses	J.R. Taylor "Wstęp do analizy błęd pomiarowego", PWN, Warszawa 2012 Andrzej Zięba "Analiza danych w naukach ścisłych i technice", PWN, Warszawa 2014 S. Brandt "Analiza danych", PWN, Warszawa 2002 H. Szydłowski "Teoria Pomiarów", PWN, Warszawa 1981 H. Szydłowski "Pracownia Fizyczna", PWN, Warszawa 1999 K. Kozłowski, R. Zieliński "I Laboratorium z Fizyki", Wydawnictwo PG, Gdańsk 2003 Adresy na platformie eNauczanie:										

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> 1) Calculation of the arithmetic mean, standard deviation and standard deviation of the mean 2) Graphical presentation of the measured data 3) Calculation of measurement error using the combined standard uncertainty method 4) Calculation of weighted average 5) The analysis of statistical data with the normal distribution 6) Linear function fit to the measured data 7) Calculation of the linear regression coefficient and its analysis 8) Implementation of simple measurements using a calliper and a micrometer
<p>Work placement</p>	<p>Not applicable</p>

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