Subject card

Subject name and code	Planning and analysis of experiment, PG_00020714
Field of study	Technical Physics

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	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Department of Atomic, Molecular and Optical Physics -> Faculty of Applied Physics and Mathematics

Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Paweł Możejko
	Teachers	dr hab. Paweł Możejko

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						
	Adresy na platformie eNauczanie: Planowanie i analiza eksperymentu - Moodle ID: 1387 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=1387						

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	65.0	100

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_U04	Practical knowledge of statistical distributions and their application in the error analysis.	[SU4] Assessment of ability to use methods and tools
	K6_W08	Ability to calculate the experimental errors in indirect measurements.	[SW1] Assessment of factual knowledge

Subject contents	1.) Experimental resultsand 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.) $\chi 2$ 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	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	50.0%
		60.0%	50.0%

Recommended reading	Basic literature	J.R. Taylor "Wstęp do analizy błędu pomiarowego", PWN, Warszawa 2012
		S. Brandt "Analiza danych", PWN, Warszawa 2002
		H. Szydłowski "Teoria Pomiarów", PWN, Warszawa 1981
		H. Szydłowski "Pracownia Fizyczna", PWN, Warszawa 1999
	Supplementary literature	K. Kozłowski, R. Zieliński "I Laboratorium z Fizyki", Wydawnictwo PG, Gdańsk 2003
	eResources addresses	Planowanie i analiza eksperymentu - Moodle ID: 1387 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=1387

Example issues/ example questions/ tasks being completed	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 coefficeint and its analysis 8) Implementation of simple measurements using a calliper and a micrometer
Work placement	Not applicable