



## Subject card

Subject name and code	Metrology and Measurement Systems, PG_00055412						
Field of study	Mechatronics						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2023/2024		
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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		6.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Manufacturing and Production Engineering -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Stefan Dzionk				
	Teachers		dr hab. inż. Stefan Dzionk  dr inż. Aleksandra Laska  dr inż. Jacek Haras  mgr inż. Anna Janeczek  dr inż. Grzegorz Gajowiec				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	30.0	0.0	0.0	75
	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	75		6.0		69.0	150
Subject objectives	Recognition with the basic principles of metrology and preparing to conduct measurements ofmechanicalsizes with the analysis of the results. Rules for determining the accuracy, tolerate and fits ofmachine parts.Knowledge of the methods of measurement and measuring instruments.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W07] has a basic knowledge in terms of metrology; knows and understands methods for measurement and processing of basic quantities that characterize mechatronic systems; knows computational methods and IT tools essential for analyses of experimental results		Student recognizes mechanical quantities subject to measurement. Determine measurement methods and systems. The student has knowledge of methods, errors and measurement uncertainty, Geometrical Product Specifications (GPS) and assessment of their accuracy.		[SW1] Assessment of factual knowledge		
	[K6_U06] is able to identify and formulate specification of simple, practical engineering tasks, distinctive for mechatronics		Student explains construction and principle of operation of measurement instruments. Student chooses suitable measuring instrument for measure given quantity. Student measures. Student analyses results of measurements. Student calculates measuring errors.		[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		

Subject contents	Basic concepts in metrology: measurement, units of measurement, standards and instruments. Accuracy and uncertainty. The geometrical structure of the product (Geometrical Product Specifications - GPS).Basics of tolerances, deviations and fits. Geometric tolerances. General Tolerances - Tolerances for linearand angular dimensions without individual tolerance indications. Fundamentals of measurements(repeatability and reproducibility of a measuring device). Surface texture. Metrological methods andequipment and principles of its selection.Laboratory: Measurements of external, internal, mixed andintermediate dimensions. Measurement of angles, cones,. Measurements of surface texture and contours.Measurements with the use of altimeters. 2D measurements. Coordinate measuring technique (manual andCNC measuring machines).Tutorials: Measurements and their uncertainty (Measurement errors, uncertainty,uncertainty budget and statistical analysis of measurement results). Tolerances and fits. Dimensional chains.Tolerance of component dimensions, interchangeability. Thread tolerance.		
Prerequisites and co-requisites	Basic knowledge of technical drawing		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	50.0%
	Laboratory	60.0%	30.0%
	Tutorial	60.0%	20.0%
Recommended reading	Basic literature	1. W. Jakubiec, J. Malinowski: Metrologia wielkości geometrycznych.WNT, Warszawa 2018.2. S. Białas, Z. Humienny, K. Kiszka: Metrologia z podstawamispecyfikacji geometrii wyrobów (GPS). Oficyna wydawnicza PW,Warszawa 2014.3. S. Adamczak, W. Makiela: Metrologia w budowie maszyn. WNT,Warszawa 20214. T. Sałaciński: Ćwiczenia laboratoryjne z metrologii. Oficynawydawnicza PW, Warszawa 2015.5. T. Sałaciński: Elementy metrologii wielkości geometrycznych.Przykłady i zadania. Oficyna wydawnicza PW, Warszawa 2013.	
	Supplementary literature	1. E. Ratajczyk: Współrzędnościowa technika pomiarowa. OWPW, Warszawa 2005 2. J. Jezierski: Analiza tolerancji i niedokładności pomiarów w budowie maszyn. WNT Warszawa 2003 3. A. Boryczko: Podstawy pomiarów wielkości mechanicznych. Wydawnictwo PG, Gdańsk 2010 4. A. Meller, P. Grudowski: Laboratorium metrologii warsztatowej i inżynierii jakości. <a href="http://www.wbss.pg.gda.pl">http://www.wbss.pg.gda.pl</a> , podręczniki (format PDF)	
	eResources addresses	Adresy na platformie eNauczanie: Metrologia i systemy pomiarowe (PG_00055412), Mtr., sem. 03, zimowy 2023/2024 - Moodle ID: 34239 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34239">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34239</a>	
Example issues/ example questions/ tasks being completed	Types of fit machine parts and their uses? Classification of measurement errors? Presentation of measurement methods.		
Work placement	Not applicable		