



## Subject card

Subject name and code	Metrology and Measurement Systems, PG_00055375						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2021/2022		
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		6.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Manufacturing and Production Engineering -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Michał Dobrzyński				
	Teachers		mgr inż. Karolina Miętka  dr inż. Michał Dobrzyński  mgr inż. Anna Janeczek				
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						
	Adresy na platformie eNauczanie: Metrologia i systemy pomiarowe , W/L/C, MiBM, sem. 02, letni 21/22 (PG_00055375) - Moodle ID: 23644 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23644">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23644</a>						
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 of mechanical sizes with the analysis of the results. Rules for determining the accuracy, tolerate and fits of machine parts.Knowledge of the methods of measurement and measuring instruments.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U10] is able to formulate the principles of selecting a material for a construction, ensuring the correct operation of a device		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		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
	[K6_W11] possesses knowledge on design, technology and manufacturing of machine parts, metrology, and quality control; knows and understands methods of measuring and calculating basic values describing the operation of mechanical systems, knows basic calculating methods applied to analyse the results of experiments		Student recognizes mechanical quantities subject to measurement. Determine measurement methods and systems.		[SW1] Assessment of factual knowledge		

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 linear and angular dimensions without individual tolerance indications. Fundamentals of measurements (repeatability and reproducibility of a measuring device). Surface texture. Metrological methods and equipment and principles of its selection.Laboratory: Measurements of external, internal, mixed and intermediate dimensions. Measurement of angles, cones,. Measurements of surface texture and contours. Measurements with the use of altimeters. 2D measurements. Coordinate measuring technique (manual and CNC 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
	Laboratory	60.0%	30.0%
	Lecture	60.0%	50.0%
	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 podstawami specyfikacji geometrii wyrobów (GPS). Oficyna wydawnicza PW, Warszawa 2014. 3. S. Adamczak, W. Makiela: Metrologia w budowie maszyn. WNT, Warszawa 2021 4. T. Sałaciński: Ćwiczenia laboratoryjne z metrologii. Oficyna wydawnicza 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 20052. J. Jezierski: Analiza tolerancji i niedokładności pomiarów w budowie maszyn. WNT Warszawa 20033. A. Boryczko: Podstawy pomiarów wielkości mechanicznych. Wydawnictwo PG, Gdańsk 20104. 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	Metrologia i systemy pomiarowe , W/L/C, MiBM, sem. 02, letni 21/22 (PG_00055375) - Moodle ID: 23644 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23644">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23644</a>	
Example issues/ example questions/ tasks being completed	Dimensional analysis of the mechanism.  Types of hole and shaft fits.  Methods and measuring instruments.		
Work placement	Not applicable		