GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Metrology and measurement systems, PG_00055050		
Field of study	Management and Production Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
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	7.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Institute of Manufacturing and Materials Technology -> 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 Wiśniewska dr inż. Aleksandra Mirowska mgr inż. Anna Janeczek dr inż. Jacek Haras dr inż. Michał Dobrzyński 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	13.0	87.0	175

Subject objectives	Recognition with the basic principles of metrology and preparing to conduct measurements of mechanicalsizes 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_U05] is able to prepare and present a presentation on the results of analysis of the tasks in the area of production engineering, is able to plan and carry out experiments, measurements, computer simulations and analyses and interpret the results and draw conclusions is able to use analytical methods, simulation and experiments for formulating and solving problems associated with production engineering	The student selects the appropriate measuring instrument to measure a given quantity measured with the use of CNC measuring systems. The student conducts simulation analyzes, prepares a measurement program in a computer environment, and takes measurements. The student analyzes the results of the measurements. Student calculates measurement 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
	[K6_W12] has detailed, theoretically founded knowledge of methods and techniques used in production quality control processes, statistical process control, modern techniques and measurement systems in quality assurance and information techniques in production systems	Student recognizes mechanical quantities subject to measurement. Determine measurement methods and systems.	[SW1] Assessment of factual knowledge
	[K6_W07] has knowledge of methods, errors and measurement uncertainty, product geometry specifications and assessment of their accuracy	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_U10] " using appropriate techniques and methods, measuring tools, is able to plan, prepare and carry out the measurement of geometrical specifications of products and conduct a critical analysis of the results	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 [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 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
Written exam	60.0%	50.0%
Tutorial	60.0%	20.0%
Laboratory	60.0%	30.0%

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. Makieła: 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. http://www.wbss.pg.gda.pl ,podręczniki (format PDF)
	eResources addresses	Adresy na platformie eNauczanie: Metrologia i systemy pomiarowe, ZiIP, 2022/2023 semestr letni - Moodle ID: 24351 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=24351
Example issues/ example questions/ tasks being completed	Types of fit machine parts and their uses? Classification of measurement errors? Presentation ofmeasurement methods.	
Work placement	Not applicable	

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