



Subject card

Subject name and code	Metrology, PG_00056512						
Field of study	Ocean Engineering, Ocean Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
Education level	first-cycle studies	Subject group			Optional subject group 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			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Kazimierz Czapczyk				
	Teachers		dr inż. Kazimierz Czapczyk				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19612 Adresy na platformie eNauczanie: Metrologia (PG_00056512) - wykład - Moodle ID: 19612 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19612						
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		0.0		0.0	30
Subject objectives	The aim of the course is to familiarize students with the basic principles of metrology as a measurement science, and to prepare them to conduct measurements of mechanical quantities with the analysis of the results. Students carry out measurements, analyze the obtained results, determine the types of errors and measurement uncertainties, as well as verify the tested items, check the tools and evaluate the measurement methods.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W05] has an organized knowledge on design, construction and operation of ocean technology objects and systems	has knowledge in the field of design, technology and production of machine parts, metrology and quality control, knows and understands the methods of measuring and calculating basic quantities describing the operation of mechanical systems, knows the basic computational methods used to analyze the results of the experiment.			[SW1] Assessment of factual knowledge		
	[K6_U03] can use computer-aided design, production and operation tools for ocean technology objects and systems	can plan an experiment in the field of measuring the basic parameters of mechanical devices with the use of specialized equipment, interpret the results and draw appropriate conclusions.			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
Subject contents	Basic concepts of metrology. Methods, errors and uncertainty of measurements. Tolerance and fits of lengths and angles. Methods of dimensional analysis. Principles of interchangeability of machine parts. The accuracy of the workmanship of the items. Elements of product geometry specification, tolerance of shape, direction and position. Characteristics of the geometrical structure of the surface of objects. Principles of geometric tolerance. Standards and measuring instruments. Coordinate measuring machine and measuring systems. Automation of measurements. Statistical analysis of the measurement results.						

Prerequisites and co-requisites	Without the initial and additional requirements.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	55.0%	70.0%
	Laboratory	100.0%	30.0%
Recommended reading	Basic literature	1. W. Jakubiec, J. Malinowski: Metrologia wielkości geometrycznych. WNT, Warszawa 2004 2. S. Białas: Metrologia techniczna z podstawami tolerowania wielkości geometrycznych dla mechaników. Oficyna wydawnicza PW, Warszawa 2006 3. Pr. zb. pod red. Z. Humienny: Specyfikacje geometryczne wyrobów. WNT, Warszawa 2004 4. S. Adamczak, W. Makiela: Metrologia w budowie maszyn. WNT, Warszawa 2004 5. P. Paczyński: Metrologia techniczna. Przewodnik do wykładów, ćwiczeń i laboratoriów. Wyd. PP, Poznań 2003.	
	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. http://www.wbss.pg.gda.pl , podręczniki (format PDF).	
	eResources addresses	Metrologia (PG_00056512) - wykład - Moodle ID: 19612 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19612	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Definition and types of measurement errors (absolute, relative, formulas, true value, conventionally true). 2. Precision and accuracy. 3. Vernier instruments and the definition and characterization of a vernier. 4. Definition and application of tolerances, deviations and clearances. Examples of mixed and tight loose fits. 5. Geometric properties and symbols characterizing tolerances. 6. Roughness definition and characterization and methods for roughness measurement. 7. Dimensional analysis of machine parts. 8. Measuring methods and instruments. 9. Normal Gaussian distribution. 10. Creating a correct records of measurement results, distribution series, histograms of relative frequencies and summary frequencies, and the calculation of the mean and standard deviation. 		
Work placement	Not applicable		