



## Subject card

Subject name and code	, PG_00056303						
Field of study	Ocean Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group					
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			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Wyposażenia Okrętu -> 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. Joanna Grzelak dr inż. Kazimierz Czapczyk				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45		4.0		26.0	75
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	Student 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	Student 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. conclusions.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[K6_W08] has knowledge of the principles of sustainable development	The student is able to correctly select the measurement method and the appropriate measuring device depending on the measured size, type of part, as well as the required accuracy and precision.	[SW1] Assessment of factual knowledge
	[K6_W03] has a basic knowledge on hydromechanics, thermodynamics, machine construction, ecology, materials science and electronics necessary to understand the construction and operation principles of ocean technology objects and equipment	The student correctly verifies the obtained results of measurements of various mechanical quantities in relation to structural data and theoretically calculated values, taking into account dimensional tolerances.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
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. <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 (PG_00056303), L, Oceanotechnika, I st. stacjon., sem. 3, zima 23/24 - Moodle ID: 33673 <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=33673">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=33673</a>	

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> <li>1. Definition and types of measurement errors (absolute, relative, formulas, true value, conventionally true).</li> <li>2. Precision and accuracy.</li> <li>3. Vernier instruments and the definition and characterization of a vernier.</li> <li>4. Definition and application of tolerances, deviations and clearances. Examples of mixed and tight loose fits.</li> <li>5. Geometric properties and symbols characterizing tolerances.</li> <li>6. Roughness definition and characterization and methods for roughness measurement.</li> <li>7. Dimensional analysis of machine parts.</li> <li>8. Measuring methods and instruments.</li> <li>9. Normal Gaussian distribution.</li> <li>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.</li> </ol>
<p>Work placement</p>	<p>Not applicable</p>