



COURSE SPECIFICATION

Course code	full-time programme:	M#2-S2-ME-106
	part-time programme:	
Course title in Polish	Zaawansowane pomiary wielkości geometrycznych	
Course title in English	Advanced Measurement: Geometric Dimensioning and Tolerancing	
Valid from (academic year)	2024/2025	

GENERAL INFORMATION

Programme of study	MECHANICAL ENGINEERING
Level of qualification	second-cycle
Type of education	academic
Mode of study	full-time programme
Specialism	all
Department responsible	Department of Metrology and Modern Manufacturing
Course leader	dr hab. inż. Krzysztof Stępień, prof. PŚk
Approved by	dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering

COURSE OVERVIEW

Course type	programme-specific	
Course status	compulsory	
Language of instruction	English	
Semester of delivery	full-time programme	Semester I
	part-time programme	Semester I
Pre-requisites		
Examination required (YES/NO)	YES	
ECTS value	3	

Mode of instruction		lecture	class	laboratory	project	seminar
No. of hours per semester	full-time programme	15		30		
	part-time programme					

LEARNING OUTCOMES





Category of outcome	Outcome code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	Students have knowledge of the basics of physical phenomena used in the measurement of geometric quantities.	MiBM2_W02 MiBM2_W12
	W02	Students are acquainted with the methods of measuring geometric quantities with the use of computer-aided measuring instruments, they know how to choose measurement parameters and how to correctly interpret measurement results, they have knowledge about geometric tolerances.	MiBM2_W12
Skills	U01	Students are able to use various types of instruments for measuring geometric quantities. He/she can select an instrument for a specific measurement task, select measurement parameters, using scientific literature and standards.	MiBM2_U11
	U02	Students are able to analyze the measurement data using appropriate statistical parameters. He/She can interpret results and assess their consistency with the assumed distribution of a random variable.	MiBM2_U01
Competence	K01	Students are able to work in a team, plan the distribution of responsibilities and coordinate the work of team members.	MiBM2_K04

COURSE CONTENT

Mode of instruction	Topics covered
lecture	Assessment of surface irregularities using the Geometrical Product Specifications. Workshop instruments for measuring geometric quantities. Length gauges. Laser interferometers. Classification of the components of the surface texture. Methods for measuring roundness, cylindricity, straightness and flatness. Definition of surface roughness. Roughness measurement methods. 2D and 3D roughness parameters. 3D surface roughness parameters. Load Curve. Coordinate measuring machines. Working principle and application of CMMs. Types of stationary CMMs. Coordinate measuring arms. Multi-sensor coordinate measuring machines. 3D scanners. Laser tracking systems. Measurement tomography.
laboratory	Rules for the use and maintenance of measuring instruments and tools. Length and angle measurements with workshop instruments. Measurements of geometric quantities with a horizontal length gauge. Optical roughness measurements. Tactile roughness measurements with stationary and portable instruments. Measurements of roundness deviations. Measurements of cylindricity deviations. Straightness measurements. Measurements of flatness. Influence of reference elements on the result of the measurement of form deviations. Measurement of geometric quantities with a coordinate measuring arm. Measurements of geometric quantities with a 3D scanner. Measurement of geometric quantities with a multi-sensor measuring machine.

ASSESSMENT METHODS

Outcome code	Methods of assessment					
	Oral examination	Written examination	Test	Project	Report	Other
W01			X			





W02			X			
U01			X		X	
U02			X		X	
K01						X

ASSESSMENT TYPE AND CRITERIA

Mode of instruction	Assessment type	Assessment criteria
lecture	non-examination assessment	Obtaining at least 50 points out of 100 possible.
laboratory	non-examination assessment	Return of properly prepared reports. Obtaining at least 50% of the points from the colloquia conducted during the semester.

OVERALL STUDENT WORKLOAD

ECTS weighting												
No.	Activity type	Student workload										Unit
		full-time programme					part-time programme					
		L	C	Lb	P	S	L	C	Lb	P	S	
1.	Scheduled contact hours	15		30								h
2.	Other contact hours (office hours, examination)	4		2								h
3.	Total number of contact hours	51										h
4.	Number of ECTS credits for contact hours	2,0										ECTS
5.	Number of independent study hours	24										h
6.	Number of ECTS credits for independent study hours	1,0										ECTS
7.	Number of practical hours	50										h
8.	Number of ECTS credits for practical hours	2,0										ECTS
9.	Total study time	75										h
10.	ECTS credits for the course <i>1 ECTS credit = 25-30 hours of study time</i>						3					ECTS

READING LIST

1. Humienny Z et al. „Geometrical Product Specifications - Course for Technical Universities” – Oficyna Wydawnicza Politechniki Warszawskiej, 2001.
2. D. J. Whitehouse “Handbook of surface metrology” CRC Press, 1994.
3. Connie L. Dotson, Fundamentals of dimensional metrology, Cengage Learning, 2016.
4. W. Jakubiec, J. Malinowski, Metrologia Wielkości Geometrycznych, WNT, Warszawa, 2007.
5. S. Adamczak, W. Makiela, Metrologia w budowie maszyn – zadania z rozwiązaniami, PWN, 2018, Warszawa,
6. S. Adamczak, „Pomiary geometryczne powierzchni”, WNT, 2009.
7. S. Adamczak, W. Makiela, Podstawy metrologii i inżynierii jakości dla mechaników – ćwiczenia praktyczne, PWN, Warszawa, 2010.

