



MODULE DESCRIPTION

Module code	full-time studies:	Z-ZIP1-E-405
	part-time studies:	Z-ZIPN1-E-405
Module name	Metrology	
Module name in Polish	Metrologia	
Valid from academic year	2019/2020	

MODULE PLACEMENT IN THE SYLLABUS

Field of study	MANAGEMENT AND PRODUCTION ENGINEERING
Level of education	1st degree
Studies profile	General
Form and method of conducting classes	Full-time and Part-time
Specialisation	All
Unit conducting the module	Department of Manufacturing Engineering and Metrology
Module co-ordinator	Krzysztof Stępień, PhD, DSc
Approved by:	Dariusz Bojczuk, PhD, DSc

MODULE OVERVIEW

Type of subject / group of subjects	Major
Module status	Compulsory
Language of conducting classes	English
Module placement in the syllabus - semester	Semester IV
Initial requirements	No requirements
Examination (YES/NO)	NO
Number of ECTS credit points	3

Method of conducting classes		Lecture	Classes	Laboratory	Project	Other
Per semester	full-time studies:	20	10	15		
	part-time studies:	12	6	9		

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Category	Symbol	Learning outcomes	Assignations to the directional learning outcomes
Knowledge	W01	A student has knowledge of mathematical methods useful in the analysis of measurement data, calculating errors and measurement uncertainties.	ZIP1_W01
	W02	A student knows the basics of physical phenomena on which the operation of modern measurement systems is based.	ZIP1_W02
	W03	A student has knowledge of measuring instruments used to measure geometric quantities and their application in modern production systems.	ZIP1_W08
Skills	U01	A student is able to effectively obtain information from the scientific literature on the measurement of geometric quantities. Can use standards to establish appropriate measurement parameters.	ZIP1_U01
	U02	A student is able to plan his work, both in the performance of individual tasks and those requiring teamwork.	ZIP1_U02
	U03	A student understands the measurement documentation, is able to interpret the information contained in the measurement protocols and assess compliance or non-compliance with the specification.	ZIP1_U08
	U04	A student applies occupational health and safety rules and regulations.	ZIP1_U16
Social competences	K01	A student understands the importance of objective measurement and the importance of proper measurement in relation to the proper course of production processes.	ZIP1_K02
	K02	A student is aware of the importance of teamwork in solving various types of engineering tasks related to the carrying out and analysis of measurements.	ZIP1_K04

TEACHING CONTENTS

Method of conducting classes	Teaching contents
Lecture	History of metrology. Classification of metrology. Tolerances and fits. Elements of the probability calculus in metrology. Elements of statistics in metrology. The concept of size, the value of quantity. Units of Measure. System of SI units. Classification of measurement errors. The concept of measurement uncertainty. Methods of calculating the measurement uncertainty. Construction and components of measuring tools. Workshop instruments for measuring length and angle. Optical instruments for measuring length and angle. Coordinate measuring machines.
Classes	Calculation of tolerances and selection of fits. Calculating the parameters of the distribution of a random variable. Calculating errors and uncertainties in direct and indirect measurements.
Laboratory	Learning the principles of carrying out measurements and selecting appropriate parameters. Measurements of geometric quantities using workshop instruments. Measurements of external, internal and mixed dimensions, Measurements of gauges for shafts and holes. Gear wheel measurements. Thread measurements. Measurements of surface roughness. Pneumatic measurements. Roundness contour measurements. Optical measurements.

METHODS OF ASSESSING TEACHING RESULTS

Symbol	Methods of checking the learning outcomes (select X)					
	Oral exam	Written exam	Test	Project	Statement	Other
W01			X			
W02			X			
W03			X			
U01					X	
U02					X	
U03					X	
K01						X
K02						X

FORM AND CONDITIONS OF PASSING

Form of classes	Form of credit	Passing conditions
Lecture	Credit with grade	Obtaining at least 50% of the points of the final test written at the end of the semester.
Classes	Credit with grade	Attendance. Obtaining at least 50% of test points during the class.
Laboratory	Credit with grade	Attendance. Delivery of a complete set of correctly prepared reports. Obtaining at least 50% of test points during the class.

STUDENT WORKLOAD

Balance of ECTS points												
No.	Type of student's activity	Student's workload										Unit
		full-time					part-time					
1.	Participation in the activities	Lc	C	Lb	P	O	Lc	C	Lb	P	O	h
		20	10	15			12	6	9			
2.	Other (consultation, exam)	2	2	2			2	2	2			h
3.	Number of hours of a student's as- sisted work	51					33					h
4.	Number of ECTS credit points which are allocated for assisted work	2,0					1,3					ECTS
5.	Number of hours of a student's un- assisted work	24					42					h
6.	Number of ECTS credit points which a student receives for unassisted work	1,0					1,7					ECTS
7.	Work input connected with practical classes	42					42					h
8.	Number of ECTS credit points which a student receives for practical classes	1,7					1,7					ECTS
9.	Total number of hours of a stu- dent's work	75					75					h
10.	Punkty ECTS za modul <i>1 ECTS=25 hours</i>	3										ECTS

LITERATURE

1. Bewoor A.K., Kulkarni V.A. (2009), *Metrology and Measurement*, MC GRAW HILL INDIA, First Edition.
2. Dotson C.L. (2016), *Fundamentals of dimensional metrology*, Cengage Learning.
3. Whitehouse D.J. (1994), *Handbook of surface metrology*, Taylor&Francis Group, CRC Press.