



MODULE SPECIFICATION

Module code	
Module title in Polish	Podstawy metrologii
Module title in English	The Fundamentals of Metrology
Module running from the academic year	2016/2016

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Surveying and Cartography
Level of qualification	first cycle (first cycle, second cycle)
Programme type	academic (academic/practical)
Mode of study	full-time (full-time/part-time)
Specialism	All
Organisational unit responsible for module delivery	The Department of Manufacturing Engineering and Metrology
Module co-ordinator	Prof. Stanisław Adamczak, PhD hab., Eng.
Approved by:	Prof. Stanisław Adamczak, PhD hab., Eng.

B. MODULE OVERVIEW

Module type	core module (core/programme-specific/elective HES*)
Module status	compulsory module (compulsory/optional)
Language of module delivery	English
Semester in the programme of study in which the module is taught	semester 2
Semester in the academic year in which the module is taught	summer semester (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	No (yes / no)
ECTS credits	2

* elective HES – elective modules in the Humanities and Economic and Social Sciences

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per	15	15			



semester					
----------	--	--	--	--	--

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to acquire methods and tools applied in length and angle measurements. A student's independent application of basic measurement techniques in product quality control, a student's independent planning of the range and methodology of tests and measurements; preparing reports on tests containing measurement uncertainty analysis with the use of mathematical statistics methods.
--------------------	--

Module outcome code	Module learning outcomes	Mode of instruction (l/c/lab/p/others)	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student knows the fundamentals of statistical analysis of data and the methods of preparing observation results.	l/c	GiK_W03	T1A_W01, T1A_W04, T1A_W07
W_02	A student knows the principles of measuring instruments functioning and obtaining data in the measurement process.	l/c	GiK_W07	T1A_W02, T1A_W04, T1A_W06
U_01	A student can conduct statistical analysis of data and correctly apply statistical methods and models in various branches of surveying and cartography.	c	GiK_U15	T1A_U08, T1A_U09
K_01	A student understands the necessity and knows the possibilities of continuous education (second- and third-degree studies, post-graduate studies, and courses), which leads to raising his/her professional, personal, and social competences.	l/c	GiK_K01	T1A_K01

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	The essence of metrology, division, and significance in various branches of science and technology; basic notions and definitions.	W_01, K_01
2	Value; the division of values; value systems; units of measurement; units of measurement systems.	W_01, K_01
3	Measurement methods, measurement error, definitions, division, general methods of calculation and the selected issues of the probability calculus.	W_01, K_01
4	The selected issues of mathematical statistics which are applicable in metrology.	W_01, K_01
5	The methods of calculating accidental errors in direct and indirect measurements; the methods of determining and eliminating systematic errors.	W_02, K_01
6	Examples concerning the analysis and synthesis of accidental and systematic errors.	W_01, K_01
7	Measuring instruments: division, construction, components, metrological and functional properties.	W_02, K_01

2. Topics to be covered in the classes



No.	Topics	Module outcome code
1	Basic principles of calculating tolerances and fits.	W_01 K_01
2	Probability calculus: distribution parameters – calculating and interpretations.	W_01 U_01 K_01
3	Error calculus; accidental errors in direct measurements.	W_01 U_01 K_01
4	Calculating measurement uncertainty in direct measurements.	W_01 U_01 K_01
5	Error calculus; accidental errors in indirect measurements.	W_02 U_01 K_01
6	Calculating uncertainty in indirect measurements.	W_02 U_01 K_01
7	A summary and obtaining a credit for the classes.	W_01 U_01 K_01

Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
W_01	A written test on the lectures and classes
W_02	A written test on the lectures and classes
U_01	A test on the classes
K_01	Comments during the lectures and a discussion during the classes

D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	Study time/ credits
1	Contact hours: participation in lectures	15
2	Contact hours: participation in classes	15
3	Contact hours: participation in laboratories	
4	Contact hours: attendance at office hours (2-3 appointments per semester)	5
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	
8		
9	Number of contact hours	35



		<i>(sum)</i>
10	Number of ECTS credits for contact hours <i>(1 ECTS credit =25-30 hours of study time)</i>	1.4
11	Private study hours: background reading for lectures	5
12	Private study hours: preparation for classes	5
13	Private study hours: preparation for tests	5
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	
18	Private study hours: preparation for an examination	
19		
20	Number of private study hours	15 <i>(sum)</i>
21	Number of ECTS credits for private study hours <i>(1 ECTS credit =25-30 hours of study time)</i>	0.6
22	Total study time	50
23	Total ECTS credits for the module <i>(1 ECTS credit =25-30 hours of study time)</i>	2 Lecture – 1 Classes – 1
24	Number of practice-based hours <i>Total practice-based hours</i>	0
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit =25-30 hours of study time)</i>	0

E. READING LIST

References	
Module website	