



MODULE DESCRIPTION

Module code	
Module name	Miernictwo cyfrowe
Module name in English	Digital Metrology
Valid from academic year	2012/2013

MODULE PLACEMENT IN THE SYLLABUS

Subject	Computer Science
Level of education	1st degree <i>(1st degree / 2nd degree)</i>
Studies profile	General <i>(general / practical)</i>
Form and method of conducting classes	Full-time <i>(full-time / part-time)</i>
Specialisation	
Unit conducting the module	The Department of Electrical Engineering and Measurement Systems
Module co-ordinator	Jerzy Augustyn, PhD hab., Eng., Professor of the University Józef Kuśmierz, PhD hab., Eng., Professor of the University
Approved by:	

MODULE OVERVIEW

Type of subject/group of subjects	Major <i>(basic / major / specialist subject / conjoint / other HES)</i>
Module status	Compulsory <i>(compulsory / non-compulsory)</i>
Language of conducting classes	Polish
Module placement in the syllabus - semester	2nd semester
Subject realisation in the academic year	Summer semester <i>(winter / summer)</i>
Initial requirements	Mathematics 1, the Fundamentals of Electronics 1 <i>(module codes / module names)</i>
Examination	No <i>(yes / no)</i>
Number of ECTS credit points	4

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other



Per semester	30		15		
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TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	The aim of the module is to familiarise students with the notions of metrology, the methods of uncertainty assessment of measurement results, digital methods of measuring basic electrical values, time and frequency as well as using the technique of digital signal processing in measurements.
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Effect symbol	Teaching results	Teaching methods (l/c/l/p/other)	Reference to subject effects	Reference to effects of a field of study
W_01	A student has systematised knowledge as regards the theory of electrical circuits as well as the theory of signals and the methods of processing them.	l/l	K_W05	T1A_W02
W_02	A student has basic knowledge as regards metrology; a student knows and understands measurement and extraction methods of basic values which characterize electronic elements and systems of various types; a student also knows indispensable calculation methods and information tools to analyse the results of the experiment.	l/l	K_W05, K_W07, K_W16	T1A_W02 T1A_W03 T1A_W04 T1AW07
W_03	A student knows the principles of using measuring equipment as well as the properties of basic measuring instruments; in addition, a student knows the principles referring to the functioning of measuring systems.	l/l	K_W02 K_W08	T1A_W02 T1A_W03 T1A_W04 T1A_W07
U_01	A student can work individually and in a team; a student is able to estimate time needed for the completion of the assigned task; a student is able to prepare and realise the schedule of work which guarantees meeting deadlines.	l	K_U02	T1A_U02
U_02	A student is able to prepare technological documentation of engineering task completion and prepare a text containing the discussion of task completion.	l	K_U03	T1A_U03
U_03	A student can use correctly selected methods and measuring instruments which facilitate the measurement of basic values characteristic as regards electrical and electronic elements as well as systems; a student can also design and complete a simple measuring system.	l/l	K_U11	T1A_U07 T1A_U10
K_01	A student is aware of the responsibility for his/her own work; a student is also ready to conform to the principles of teamwork and bearing his/her responsibility for the collectively completed tasks.	l	K_K03	T1A_K03 T1A_K04
K_02	A student is aware of following the principles of ethics.	l/l	K_K05	T1A_K05

Teaching contents:

Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
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Projekt współfinansowany ze środków Unii Europejskiej w ramach Europejskiego Funduszu Społecznego

1	Basic metrology concepts. Units and measurement systems, the patterns of electrical and time values.	W_01,W_02, W_03, U_03
2	Measurement error, error limits, calculating the uncertainty of measurement result.	W_02, W_03, U_03
3	Measurement object, the classification of measurement signals, sampling and signal quantisation. Signal processing in a time, frequency and value domain.	W_02, W_03, U_03
4	Fourier transform, the properties of Discrete Fourier Transform. The algorithm of Fast Fourier Transform.	W_02, W_03, U_03
5,6	Analogue-to-digital processing: processing methods, errors in discrete signal measurement. Analogue and digital interface.	W_02, W_03, U_03
7,8	Digital codes and signals.	W_02, W_03, U_03
9,10	Time, frequency, and phase shift measurements.	W_02, W_03, U_03
11	Digital methods of measuring voltage, electric current, power, and energy.	W_02, W_03, U_03
12	Digital methods of measuring resistance and impedance.	W_02, W_03, U_03
13	Multimeters and digital oscilloscopes, arbitrary waveform generators.	W_02, W_03, U_03
14	Virtual measuring instruments.	W_02, W_03, U_03
15	A final test.	K_02

Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module
1	Introduction.	W_02
2	The application of a digital multimeter in measurements.	W_02, W_03, U_02, U_03, K_01
3	Digital frequency and phase shift measurement.	W_02, W_03, U_02, U_03, K_01,
4	Testing analogue-to-digital converters.	W_02, W_03, U_02, U_03, K_01,
5	The application of a digital oscilloscope in measurements.	W_02, W_03, U_02, U_03, K_01
6	Digital signal processing.	W_02, W_03, U_03, K_01
7	A design and completing a virtual panel in LabWindows environment for the HP34401 device.	W_02, W_03, U_03, K_01
8	Summary of knowledge and skills acquired as part of the completed laboratory classes.	W_01,W_02,W, U_01, U_02, U_03, ,K_02

The methods of assessing teaching results

Effect symbol	Methods of assessing teaching results (assessment method, including skills – reference to a particular project, laboratory assignments, etc.)
W_01	A report from laboratory classes, a final test on laboratory class assignments.
W_02	A report from laboratory classes, a final test on laboratory class assignments.
W_03	A test qualifying for laboratory classes.
U_01	A report on laboratory classes, a final test on laboratory class assignments.
U_02	Assessing the completion of syllabus concerning laboratory classes.



U_03	A report from laboratory classes.
K_01	Reports from laboratory classes.
K_02	A final test on lectures and laboratory classes.

STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	Student's workload
1	Participation in lectures	30
2	Participation in classes	
3	Participation in laboratories	15
4	Participation in tutorials (2-3 times per semester)	5
5	Participation in project classes	0
6	Project tutorials	0
7	Participation in an examination	0
8		
9	Number of hours requiring a lecturer's assistance	50 <i>(sum)</i>
10	Number of ECTS credit points which are allocated for assisted work <i>(1 ECTS credit point=25-30 hours)</i>	2
11	Unassisted study of lecture subjects	15
12	Unassisted preparation for classes	
13	Unassisted preparation for tests	10
14	Unassisted preparation for laboratories	10
15	Preparing reports	10
16	Preparing for a final laboratory test	5
17	Preparing a project or documentation	0
18	Preparing for an examination	0
19	Preparing questionnaires	
20	Number of hours of a student's unassisted work	50 <i>(sum)</i>
21	Number of ECTS credit points which a student receives for unassisted work <i>(1 ECTS credit point=25-30 hours)</i>	2
22	Total number of hours of a student's work	100
23	ECTS credit points per module <i>1 ECTS credit point=25-30 hours</i>	4
24	Work input connected with practical classes <i>Total number of hours connected with practical classes</i>	65
25	Number of ECTS credit points which a student receives for practical classes <i>(1 ECTS credit point=25-30 hours)</i>	2.6