

MODULE DESCRIPTION

Module code	Z-ZIP-256z
Module name	Podstawy miernictwa elektrycznego
Module name in English	Fundamentals of Electrical Measuring
Valid from academic year	2016/2017

A. MODULE PLACEMENT IN THE SYLLABUS

Field of study	Management and Production Engineering
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	All
Unit conducting the module	The Department Mathematics and Physics
Module co-ordinator	Medard Makrenek, PhD
Approved by:	

B. 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	English
Module placement in the syllabus - semester	6th semester
Subject realisation in the academic year	Summer semester <i>(winter / summer)</i>
Initial requirements	Statistics, Physics 1 <i>(module codes / module names)</i>
Examination	No <i>(yes / no)</i>
Number of ECTS credit points	3

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	15		15		

C. TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	The aim of the module is to master basic knowledge as regards general problems of electrical surveying (metrology), uncertainty analysis of measuring devices and measurements, the construction, the principle of operation as well as electronic properties of measuring devices, measuring methods of electrical values, signal parameters, and the parameters of elements and electronic sub-assemblies.
----------------------	--

Effect symbol	Teaching results	Teaching methods (l/c/lab/p/other)	Reference to subject effects	Reference to effects of a field of study
W_01	A student has knowledge as regards physics comprising the knowledge of electricity indispensable to understand basic physical phenomena appearing in simple electric circuits.	l	K_W01	T1A_W01 T1A_W07 InzA_W02
W_02	A student has systematised knowledge as regards statistics enabling to understand the issues of measuring techniques and conduct measurement errors analysis.	l	K_W01 K_W02	T1A_W01 T1A_W07 InzA_W02 T1A_W01 T1A_W02 T1A_W07
W_03	A student has basic knowledge as regards the structure of gauges to measure voltages and electric currents including those of an oscilloscope.	l/lab	K_W02	T1A_W01 T1A_W02 T1A_W07 InzA_W02
W_04	A student has basic knowledge of technical conditioning of correct work as regards measuring devices.	l/lab	K_W08	T1A_W04 InzA_W02
U_01	A student can reach valuable information and is able to use it in practice.	l/lab	K_U01	TA1_U01
U_02	A student can work individually and in a group. A student is able to estimate working hours in order to complete the scheduled tasks. A student can also take measurements of electrical and non-electrical values applying various measuring devices.	l/lab	K_U02	TA1_U02
U_03	A student is able to take measurements, illustrate their results and present them using the knowledge of metrology.	lab	K_U01 K_U09 K_U16	TA1_U01 TA1_U08 TA1_U11
U_04	A student is capable of self-betterment and preparing a particular part of material.	l/lab	K_U01	TA1_U01
K_01	A student is aware of the responsibility for his/her own and collective work. A student can conform with the principles of teamwork.	lab	K_K04	T1A_K03 T1A_K04
K_02	A student understands the necessity of improving his/her professional competences.	l/lab	K_K01	T1A_K01

Teaching contents:

1. Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
1	A measuring object, its model, physical quantity, and units of measurement. Measurement and measurement methods. Error analysis: sources, types, and measurement uncertainty.	W_01 W_02

2	The structure and the principle of operation concerning analog gauges. Technical parameters of analog gauges. Error sources. The measurement of constant physical quantities in time.	W_03
3	The construction of a digital voltmeter. Analysing block diagrams.	W_03 W_04
4	The construction of a digital current meter. Gauges measuring time.	W_03 W_04
5	Measuring A/C and C/A converters, measurement devices and systems.	W_03 U_01 K_02
6	An oscilloscope as a universal gauge. Oscilloscope construction. The possibilities of digital oscilloscopes to gather and visualise data as well as to statistical analysis.	W_03 W_04 U_01 K_02
7	The methods of measuring electrical and non-electrical values: voltage and amperage, resistance, velocity, acceleration, power, geometric dimensions, pressure and temperature.	W_01 W_04 U_01 K_02

2. Teaching contents as regards classes

Class number	Teaching contents	Reference to teaching results for a module

3. Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module
1	The method of measuring voltage and current in AC/DC circuits.	U_01 U_02 U_03 U_04 K_01
2	The methods of measuring temperature.	U_01 U_02 U_03 U_04 K_01
3	Measuring the parameters of working environment. Analysing the content of CO ₂ in the air.	U_01 U_02 U_03 U_04 K_01
4	Measuring electric parameters of work of loudspeakers and semi-conductor transistors.	U_01 U_02 U_03 U_04 K_01
5	Checking basic metrological parameters of gauges.	U_01 U_02 U_03 U_04 K_01
6	Normal distribution in electric and non-electric measurements	U_01 U_02

		U_03 U_04 K_01
--	--	----------------------

4. The characteristics of project assignments

The methods of assessing teaching results

Effect symbol	Methods of assessing teaching results <i>(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)</i>
W_01	Checking knowledge orally or in a written form prior to laboratory classes.
W_02	Checking knowledge orally or in a written form prior to laboratory classes.
W_03	Checking knowledge orally or in a written prior to laboratory classes. A conversation and control questions during laboratory classes. A report from the conducted measurements.
W_04	A conversation and control questions during laboratory classes. Observing a student's work during laboratory classes.
U_01	Oral verification during laboratory work.
U_02	Observing a student's work during laboratory classes. A mark on the basis of an exercise prepared by a student.
U_03	A mark on the basis of a report (prepared by a student) from the completed exercise.
U_04	A mark on the basis of a report (prepared by a student) from the completed exercise.
K_01	A mark on the basis of a report (prepared by a student) from the completed exercise. Observing a student's work during laboratory classes.
K_02	A mark on the basis of the ability concerning problem solving, i.e. designing measurement systems.

D. STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	Student's workload
1	Participation in lectures	15
2	Participation in classes	
3	Participation in laboratories	15
4	Participation in tutorials (2-3 times per semester)	4
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	
8		
9	Number of hours requiring a lecturer's assistance	34 <i>(sum)</i>
10	Number of ECTS credit points which are allocated for assisted work <i>(1 ECTS point=25-30 hours)</i>	1.4
11	Unassisted study of lecture subjects	15
12	Unassisted preparation for classes	
13	Unassisted preparation for tests	
14	Unassisted preparation for laboratories	15
15	Preparing reports	10
15	Preparing for a final laboratory test	7
17	Preparing a project or documentation	
18	Preparing for an examination	
19		
20	Number of hours of a student's unassisted work	45 <i>(sum)</i>
21	Number of ECTS credit points which a student receives for unassisted work <i>(1 ECTS point=25-30 hours)</i>	1.6
22	Total number of hours of a student's work	79
23	ECTS points per module <i>1 ECTS point=25-30 hours</i>	3
24	Work input connected with practical classes <i>Total number of hours connected with practical classes</i>	49
25	Number of ECTS credit points which a student receives for practical classes <i>(1 ECTS point=25-30 hours)</i>	1.7

E. LITERATURE

Literature list	<ol style="list-style-type: none"> 1. Chwaleba A., Poniński M., Siedlecki A., <i>Metrologia elektryczna</i>, WNT, Warszawa 1998. 2. Dusza J., Gortat G., Leśniewski A., <i>Podstawy miernictwa</i>, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1998. 3. Parchański J., <i>Miernictwo elektryczne i elektroniczne</i>, WSiP, Warszawa 1996. 4. Praca zbiorowa, <i>Współczesna metrologia. Zagadnienia wybrane</i>, WNT, Warszawa 2004.
Module website	