



MODULE DESCRIPTION

Module code	full-time studies:	Z-ZIP1-E-603
	part-time studies:	Z-ZIPN1-E-603
Module name	Fundamentals of Electrical Measuring	
Module name in Polish	Podstawy miernictwa elektrycznego	
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 Mathematics and Physics
Module co-ordinator	Medard Makrenek, 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 VI
Initial requirements	Statistics
Examination (YES/NO)	NO
Number of ECTS credit points	2

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

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Category	Symbol	Learning outcomes	Assignations to the directional learning out-comes
Knowledge	W01	A student has knowledge of physics, including knowledge of electricity necessary to understand the basic physical phenomena occurring in simple electrical circuits.	ZIP1_W01
	W02	A student has a structured knowledge of statistics that allows him to understand the problems of measurement techniques and to analyze measurement errors. Can use the R language for statistical analyzes and inference.	ZIP1_W01 ZIP1_W02 ZIP1_W08
	W03	A student has knowledge of construction and meters for measuring electric voltages and currents, including an oscilloscope. Can carry out measurements and analyze them.	ZIP1_W02 ZIP1_W08
Skills	U01	He can carry out measurements, present the results of measurements and present them using the knowledge of metrology.	ZIP1_U01
	U02	He can work individually and in a team. He can estimate the working time to perform the intended tasks. He is able to carry out measurements of electrical and non-electrical quantities using various measuring instruments.	ZIP1_U02
	U03	Is aware of the responsibility for his own and team work. He can submit to the rules of working in a team.	ZIP1_U01 ZIP1_U09 ZIP1_U16
Social competences	K01	Understands the need for constant replenishment of knowledge in the field of new materials and technological processes.	ZIP1_K01

TEACHING CONTENTS

Method of conducting classes	Teaching contents
Lecture	A measuring object, its model, physical quantity, and units of measurement. Measurement and measurement methods. Error analysis: sources, types, and measurement uncertainty. 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. The construction of a digital voltmeter. Analyzing block diagrams. The construction of a digital current meter. Gauges measuring time. An oscilloscope as a universal gauge. Oscilloscope construction. The possibilities of digital oscilloscopes to gather and visualize data as well as to statistical analysis. The methods of measuring electrical and non-electrical values: voltage and amperage, resistance, velocity, acceleration, power, geometric dimensions, pressure and temperature. A/D and D/A measuring converters, measuring instruments and systems. Sending measurement data and preparing them for statistical analyzes using the interpreted R programming language.

Laboratory	The method of measuring voltage and current in AC/DC circuits. The methods and techniques of measuring temperature. Measuring the parameters of working environment. Analysing the content of CO₂ in the air. Measuring electric parameters of work of loudspeakers and semi-conductor transistors.
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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	X
W03					X	X
U01					X	X
U02					X	X
U03					X	X
K01						X

FORM AND CONDITIONS OF PASSING

Form of classes	Form of credit	Passing conditions
Lecture	Credit with grade	Participation in classes, short homework
Laboratory	Credit with grade	Obtaining positive grades from all laboratory exercises

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
		15		15			9		9			
2.	Other (consultation, exam)	2		2			2		2			h
3.	Number of hours of a student's as- sisted work	34					22					h
4.	Number of ECTS credit points which are allocated for assisted work	1,4					0,9					ECTS
5.	Number of hours of a student's un- assisted work	16					28					h
6.	Number of ECTS credit points which a student receives for unassisted work	0,6					1,1					ECTS
7.	Work input connected with practical classes	25					25					h
8.	Number of ECTS credit points which a student receives for practical classes	1,0					1,0					ECTS
9.	Total number of hours of a stu- dent's work	50					50					h
10.	Punkty ECTS za modul <i>1 ECTS=25 hours</i>	2										ECTS

LITERATURE

1. Tumanski S. (2006), *Principies of electrical measurement*, Taylor&Francis, London, UK
<https://labtpl.files.wordpress.com/2018/02/principles-of-electrical-measurement.pdf>
2. Codreanu C. (2021), *Basic of Metrology standardization and electrical measurements*, Publishing House "TEHNICA-INFO"