

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Pomiary elektryczne wielkości nieelektrycznych**
 Name in English: **Electrical Measurement Nonelectrical Values**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable): **Renewable Energy Sources**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ELR043307**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		15		
Number of hours of total student workload (CNPS):	60		30		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	2		1		
including number of ECTS points for practical (P) classes :			1		
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40		0.70		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. He has basic knowledge in the field of linear circuits with sinusoidal signal. He knows the rules of the modeling of electrical circuits and their mathematical description.
2. He has basic knowledge of metrology.
He knows the measuring systems for high values of voltage and current measuring transducers, transmitters rms bridge
3. circuits for measuring resistance, reactance and impedance compensating voltage measurement circuits. He knows the metrological characteristics of digital voltmeters
4. He Has a basic skills in the implementation, analysis and design of electrical measurements

SUBJECT OBJECTIVES

- C1. Learning the methods and non-electrical measuring systems,.
 C2. Proficiency in standard measuring instruments
 C3. Knowing the structure of non-electrical sensors
 C4. Acquisition and consolidation of social skills including emotional intelligence skills involving the cooperation of a group of students with a view to effective problem solving. Responsibility, honesty and fairness in the procedure observance force in academia and society

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 He or she knows the design, operation and performance of processing the most common transducers
 PEK_W02 He has a broad knowledge of the methods and systems for measuring various non-electrical quantities. He knows the physical quantities of the processing of the electrical quantities
 PEK_W03 He or she can assess the impact of external factors affecting the essential elements of measurement circuit on the result

relating to skills:

- PEK_U01 He can to choose the measuring tool for measuring non-electrical values
 PEK_U02 He or she can use the tools to measure temperature, pressure, stress, vibration - vibration, moisture content, chemical composition, flow rates of gases and liquids
 PEK_U03 He or she has ability to assess the impact of external factors on the result. He can estimate the error of the measurement method and enter the amendment

relating to social competences:

- PEK_K01 He or she is aware of their own responsibility for their work and a willingness to comply with the principles of teamwork. He searches information and its critical analysis, properly identifies and resolves the dilemmas of working in the profession

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Processing of non-electrical quantities into electrical signals - general issues	2
Lec 2	Temperature measurements: the scale of temperature, measurement methods. Resistance thermometers and thermocouples	2
Lec 3	Methods for measuring the temperature of solids, liquids and gases, Temperature measurements in industrial engineering	2
Lec 4	Flow measurement of gases and liquids	2
Lec 5	Measurement of pressure. Humidity Measurement.	2
Lec 6	Strain gauge transducers, torque measurement, force measurement	2
Lec 7	pH and conductivity measurements	2
Lec 8	Test	1
Total hours:		15

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of the safety rules and principles of assessment laboratory. Presentation of laboratory	2
Lab 2	Measurements of gas flow	2
Lab 3	Determination characteristics of the sensors and pressure transmitters	2
Lab 4	Measurements of strain - the characteristics of transducers, force transducers study	2
Lab 5	Temperature measurement - determining the characteristics of transducers	2
Lab 6	Measurements of pH and conductivity of liquid	2
Lab 7	Optical Measurement-Study on the contrast of outdoor lighting	2
Lab 8	summary	1
Total hours:		15

TEACHING TOOLS USED	
N1.	a
N2.	Laboratory run in the traditional manner of exercises + student groups, a report

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEK_W01 PEK_W02 PEK_W03	test
P(w)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Average assessment of reports done laboratory activities
P(L)	P=F1	

PRIMARY AND SECONDARY LITERATURE	
PRIMARY LITERATURE: [1] Miłek M., Metrologia elektryczna wielkości nieelektrycznych, Uniwersytet Zielonogórski 2006. [2] Janiczek R., Elektryczne miernictwo przemysłowe, Wydawnictwo politechniki częstochowskiej 2006. [3] Rząsa M., Kiczma B., Elektryczne i elektroniczne czujniki temperatury, WKŁ Warszawa 2005. [4] Romer R., Miernictwo przemysłowe, PWN, Warszawa, 1970	
SECONDARY LITERATURE: [1] Stryburski W. Przetworniki tensometryczne - konstrukcja, projektowanie, użytkowanie, WNT, Warszawa 1971. [2] Editors: Erika Kress-Rogers and Christopher J. B. Brimelow - Instrumentation and sensors for the food industry, second edition, CRC Press 2001	

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR043307 - Electrical Measurement Nonelectrical Values
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**
AND SPECIALIZATION **Renewable Energy Sources**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K2ETK_W05	C.1 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_W02	K2ETK_W05	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_W03	K2ETK_W05	C.1 C.2 C.3 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_U01	K2ETK_U04	C.2 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.2
PEK_U02	K2ETK_U04	C.2 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.2
PEK_U03	K2ETK_U04	C.2 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.2
PEK_K01	K2ETK_K02	C.1 C.2 C.3 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.1 N.2