

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Miernictwo elektryczne 1**  
 Name in English: **Electrical Metrology 1**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **obligatory**  
 Subject code: **ELR053314**  
 Group of courses: **NO**

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

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Has a basic knowledge of mathematical functions properties, derivative calculations.
2. Has a basic knowledge of physics.

**SUBJECT OBJECTIVES**

- C1. Introduction student with basic knowledge of metrology terms, error and uncertainty theory and basis information about analogue measurement instruments.
- C2. Awareness student possibilities of using measurement circuits realizing different measurement methods to measure basic electrical quantities.

**SUBJECT LEARNING OUTCOMES***relating to knowledge:*

PEU\_W01 Has a knowledge of measurement uncertainties calculations for analogue and digital instruments.

PEU\_W02 Has a knowledge of uncertainties calculation in indirect measurements and has a knowledge of passive elements standards.

*relating to skills:**relating to social competences:*

PEU\_K01 Can search information, and can made critical analysis of this information.

**PROGRAMME CONTENT**

Form of classes - lecture		Number of hours:
Lec 1	History brief of measurement units evolution. Basic terms of metrology. Metrological services organization in Poland.	2
Lec 2	Analogue and digital instruments measurements errors. Classes and errors of measurement tools. Systematic, random errors and mistakes.	2
Lec 3	Uncertainty theory. Uncertainty type A and B. Total uncertainty. Statistical distributions: Gauss and t-Student.	2
Lec 4	Direct measures uncertainty. Indirect measures uncertainty.	2
Lec 5	Resistance, inductance and capacitance standards.	2
Lec 6	Moving-coils meters construction and extending ranges.	2
Lec 7	Analogue instruments dynamic properties. Mean and RMS value measurements of sinusoidal signals using moving-coil meters.	2
Lec 8	Test.	1
Total hours:		<b>15</b>

**TEACHING TOOLS USED**

N1. Traditional lecture, multimedia presentations.

**EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT**

<b>Evaluation</b> <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	<b>Educational effect number</b>	<b>Way of evaluating educational effect achievement</b>
F1(w)	PEU_W01 PEU_W02 PEU_K01	Test.
P(w)	P=F1	

**PRIMARY AND SECONDARY LITERATURE****PRIMARY LITERATURE:**

- [1] Chwaleba A., Poniński M., Siedlecki A.: Metrologia elektryczna, WNT, Warszawa 2010.
- [2] Miernictwo elektryczne - Ćwiczenia laboratoryjne, praca zbiorowa pod redakcją D. Koczeli, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2001
- [3] Tumański S.: Technika pomiarowa, WNT, Warszawa, 2007
- [4] Derlecki S., Metrologia elektryczna i elektroniczna, Podręczniki Akademickie- Pol. Łódzka, 2010
- [5] Kalus-Jęcek B., Wzorce wielkości elektrycznych i ocena niepewności pomiarów, Wyd. Pol. Łódzkiej, Łódź, 2000

**SECONDARY LITERATURE:**

- [1] Kwiatkowski W.: Miernictwo elektryczne. Analogowa technika pomiarowa, OW Pol. Warszawskiej, Warszawa, 1998
- [2] Lisowski M., Podstawy metrologii, Of. Wyd. Pol. Wrocławskiej, Wrocław, 2011
- [3] Marcyniuk A., Pasecki E., Pluciński M., Szadkowski B., Podstawy Metrologii Elektrycznej, Warszawa, WNT, 1984.
- [4] Orzeszkowski Z.: Podstawy metrologii elektrycznej, Wyd. Pol. Wrocławskiej, Wrocław 1981.
- [5] Czajewski J., Podstawy metrologii elektrycznej, OW Pol. Warszawskiej, Warszawa, 2008
- [6] Piotrowski J., Podstawy miernictwa, WNT, 2003

**SUBJECT SUPERVISOR**

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