

## DESCRIPTION OF THE COURSES

- Course code: ARR3301
- Course title: *INTRODUCTION TO METROLOGY*
- Language of the lecturer: *polish*

<i>Course form</i>	<i>Lecture</i>	<i>Classes</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Number of hours/week*</i>	2		1		
<i>Number of hours/semester*</i>	30		15		
<i>Form of the course completion</i>	<i>Test</i>		<i>Acceptance</i>		
<i>ECTS credits</i>	2		2		
<b>Total Student's Workload</b>	60		60		

- Level of the course (basic/advanced): *basic*
- Prerequisites: *It corresponds to the basic studies subject of Electrical Faculty*
- Name, first name and degree of the lecturer/supervisor:  
*Zdzisław Nawrocki prof.*
- Names, first names and degrees of the team's members:  
Karol NOWAK dr inż.  
Daniel DUSZA dr inż.  
Grzegorz KOSOBUDZKI dr inż.  
Wojciech GROTOWSKI dr inż.
- Year: I Semester: 1.....
- Type of the course (obligatory/optional): *obligatory*
- Aims of the course (effects of the course):
- Form of the teaching (traditional/e-learning): *traditional*
- Course description:
- *Presentation of general methods, measuring instruments and systems with special consideration for metrological properties. Standards of electrical units and sources of standard signals. Analogue and digital meters. Measuring converters. Measurements of power and energy registering instruments and oscilloscope. Measuring bridges and compensators. Introduction into measuring systems, organization and management of measuring systems, virtual instruments.*
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
<i>1. Basic terms – object, measuring process, measuring instruments, measuring methods, measuring systems</i>	2
<i>2. Basic of metrological analysis – error classification and calculation, determination of transformation characteristics</i>	4
<i>3. General information about measuring instruments – division and structures of measuring instruments and converters</i>	2
<i>4. Characteristics and parameters describing static and dynamic properties of measuring instruments and converters</i>	2
<i>5. Standards of electrical units and sources of standard signals.</i>	2
<i>6. Analogue and digital meters. Measurement of electrical values</i>	5
<i>7. Electrical power and energy measurement</i>	3
<i>8. Registering instruments. Analogue and digital oscilloscopes.</i>	2
<i>9. Direct and alternating current measuring bridges. Bridge measuring</i>	2

<i>errors compensators</i>	
<i>10. Introduction into measuring systems – definitions, system organisation, virtual instruments.</i>	2
<i>11. Test</i>	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
  1. Analogue and digital instruments – introduction to laboratory.
  2. Direct and alternating voltage measuring.
  3. Verification of basic measuring apparatus bias errors.
  4. Measurements of resistance and direct current power with application of indirect method
  5. Power measurement in single- and three-phase systems.
  6. Measurement of frequency and phase displacement of periodical signals
  7. Measurement amplifier – determination of basic metrological parameters
- Project – the contents:
- Basic literature:
  1. Chwaleba A., Poniński M., Siedlecki A.: *Metrologia elektryczna*, WNT, Warszawa 1994.
  2. *Miernictwo elektryczne – Ćwiczenia laboratoryjne, praca zbiorowa pod redakcją D. Koczeli, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2001*
  3. Kwiatkowski W.: *Miernictwo elektryczne. Analogowa technika pomiarowa, OW Pol. Warszawskiej, Warszawa, 1998*
  4. Tymański S.: *Technika pomiarowa, WNT, Warszawa, 2007*
  5. Czajewski J., *Podstawy metrologii, Oficyna Wyd. Pol. Warszawskiej, Warszawa, 2003*
- Additional literature:
  1. Dacko G., Jaskulski J., Koczela D., *Miernictwo elektryczne, Skrypt Pol. Wr. 1993.*
  2. Marcyniuk A., Pasecki E., Pluciński M., Szadkowski B., *Podstawy Metrologii Elektrycznej Warszawa, WNT, 1984.*
  3. Bartoszewski J., Koczela D.: *Ćwiczenia laboratoryjne z miernictwa elektrycznego, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 1998.*
  4. Orzeszkowski Z.: *Podstawy metrologii elektrycznej, Wyd. Pol. Wrocławskiej, Wrocław 1981.*
  5. Parchański J., *Miernictwo elektryczne i elektroniczne, WSzIP, Warszawa, 2006*
- Conditions of the course acceptance/creditation: *Egzam*

\* - depending on a system of studies