

## DESCRIPTION OF THE COURSES

- Course code: ELR3313
- Course title: ADVANCED MEASUREMENT IN ELECTRIC POWER ENGINEERING
- Language of the lecturer: English

<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>	60		30		
<i>Form of the course completion</i>	test		pass		
<b>ECTS credits</b>					
<b>Total Student's Workload</b>					

- Level of the course (~~basic~~/advanced):
- Prerequisites: Mathematics, Circuit Theory
- Name, first name and degree of the lecturer/supervisor: Nawrocki Zdzisław prof. Fleszyński Janusz prof.
- Names, first names and degrees of the team's members: Kosobudzki Grzegorz PhD, Wieczorek Krzysztof PhD.
- Year:..... Semester:.....
- Type of the course (~~obligatory~~/optional):
- Aims of the course (effects of the course): knowledge of basic problems and practical aspects of analogue and digital measurement.
- Form of the teaching (traditional/~~e-learning~~):
- Course description: The course contains the basic problems and practical aspects of analogue and digital measurement. After introduction and general theoretical, the following practical problems are presented: problems measurement of voltage and current (DC and AC), and power meter. Following subject are presented in the course: high voltage measurements, diagnostic tests of high voltage equipment insulation. The course familiarizes the students with the measurement and generation methods of high voltage, the partial discharges investigation. Special emphasis is put on the presentation of the physical and metrological fundamentals of different kinds of diagnostic test (electric, acoustic, optoelectronic, physico-chemical), the detection of various defects in the insulation of equipment, problems of modern diagnostic.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
<i>1.Introduction. Basis terms of metrology. Error and uncertain theory of measurement.</i>	2
<i>2. Metrological properties maximum value, minimum value, RMS value transducer.</i>	2
<i>3.Metrological properties of electric analogue meters in direct and alternating current circuits.</i>	2

4. Introduction to digital method of measurement. Sampling, quantization and coding of signal	2
5. Digital to analog and analog to digital converters	2
6. Digital voltmeter and wattmeter	2
7. Digital oscilloscope	2
8. Analogue and digital measuring systems of electric and nonelectric quantity.	2
9. Characteristic of high voltage measurement, aims and diagnostic test methods of high voltage equipment insulation.	2
10. Test systems of high voltage.	2
11. Direct measurement methods of high voltage.	2
12. Different types of high voltage dividers: direct voltage, alternating 50Hz and surge voltage. Cooperation of capacitive voltage divider with a voltage transformer.	2
13. Optoelectronic measurement methods of high voltage and currents in high voltage circuits.	2
14. Diagnostic test methods of high voltage insulation systems.	2
15. Physical and metrological fundamentals of partial discharges measurement of the insulation of high voltage equipment.	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents: 1. Measurement of AC voltage using sampling voltmeter. 2. Oscilloscope utilization in measurements. 3. Investigation of metrological property of temperature measuring systems. 4. Generation and measurement of high surge voltage. 5. Indirect measurement methods of high alternating voltage. 6. Test of high voltage insulator.
- Project – the contents:
- Basic literature:
  1. J. Mc.Ghee, I.A. Henderson, M.J. Korczyński, W. Kulesza: Scientific metrology, Technical University of Lodz, Lodz, 1998.
  2. J. Mc.Ghee, I.A. Henderson, M.J. Korczyński, W. Kulesza: Measurement data handling, vol. 1 and vol. 2, Technical University of Lodz, Lodz, 2001
  3. N. Kularanta: Digital and analogue instrumentation. IEE, London, 2003.
  4. D. Kind: An introduction to high voltage experimental technique, Vieweg 1980.
  5. E. Kuffel, W.S. Zaengel, J. Kuffel: High Voltage Engineering Fundamentals, Elsevier, 2000
- Additional literature:
- Conditions of the course acceptance/creditation:

\* - depending on a system of studies