

DESCRIPTION OF THE COURSES

- Course code: ELR 3362
- Course title: Electrometric electronic measurement systems.
- 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>	<i>1</i>		<i>1</i>		
<i>Number of hours/semester*</i>	<i>11</i>		<i>11</i>		
<i>Form of the course completion</i>	<i>colloquim</i>		<i>note</i>		
<i>ECTS credits</i>					
<i>Total Student's Workload</i>					

- Level of the course (basic/advanced): advanced
- Prerequisites:
- Name, first name and degree of the lecturer/supervisor: Piotr Madej Ph.D.
- Names, first names and degrees of the team's members:
- Year:... II Semester:..... 4
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): Experience of measurement specific and extremely values measurement problems on measurable limit
- Form of the teaching (traditional/e-learning): traditional
- Course description:
Principles construction and application electronic electrometric equipment. Fenomena of electrometric measurements: sources with extremaly low internal power and extremaly high internal resistance. Electronic picoammeters, gigaohmmeterssss, microprocessor i/u and u/u convertors. Monitoring and long distance transmission of signal.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Introduction. Characterisation of signal souces with extremaly low internal power and extremaly high internal resistance.	2
2. Methods and equipment for measurement and registrated of ultra low DC and low-frequency current. Electronic picoammeters.	1
3. Methods and equipment of ultra high resistance. Electronic megaohmmeters: ranges, accucacy.	1
4.Methods and equipment of measurement of electrostatic potentials and DC and low-frequency voltage without current loading. Electrometric amplifiers and voltmeters: internal resistance and current.	1
5.Methods of measurement of electrostatic charges. Electronic coulombometers.	2
6.Modern electronic electrometric circuits and elemets: operational electrometric amplifiers, high value resistors, cables, connectors, and their parameters.	2
7. Calibraaation and testing of electrometric measuring systems.	1
8. Colloquium.	

- Classes – the contents:

- Seminars – the contents:
 - Laboratory – the contents:
 1. Introduction.
 2. Differential amplifier. Parameters.
 3. Current/voltage conversion.
 4. Charge/voltage conversion.
 5. Electronic megaohmmeters.
 6. Instrumentation amplifier with isolation barrier.
 7. Applications of picoammeter and low DC current source.
 - Project – the contents:
 - Basic literature:
 - Zbigniew Kłos: Calibration of electrometric measuring systems. Scientific Papers of the Institute of Electrical Machines, Drives and Metrology of the Wrocław University of Technology No. 55, Monographs No. 17 , 2004.
 - Kłos Z. Problematyka wzorcowania aparatury elektrometrycznej. Monografia nr 17/2004. Oficyna Wydawnicza Politechniki Wrocławskiej.
 - Iljukowicz A.M.: Tiechnika elektrometrii. Energija, Moskwa 1976
 - Katalogi firm: Burr-Brown, Analog Devices.
 - Additional literature:
 - Kłos.Z.: Wysokoomowe rezystory precyzyjne stosowane w elektrometrii. Normalizacja,1992, nr 7.
 - Kłos Z.: Własności wysokoomowych rezystorów tlenkowych typu MOX. Normalizacja,1992, nr12.
 - Kłos Z.: Układ analogowy do pomiaru bardzo małych prądów stałych. Pomiary Automatyka Kontrola, 1992, nr 5.
 - Kłos Z.: Elektrometryczny wzmacniacz pomiarowy sygnałów bioelektrycznych . Pomiary Automatyka Kontrola, 1993, nr 12.
 - Kłos Z., Madej P.: Analogowe metody pomiaru wielkich rezystancji. Normalizacja,1993, nr 3.
 - Kłos Z. Madej P.: Elektroniczny megaomomierz analogowy typ EMA-1. Pomiary Automatyka Kontrola, 1994, nr 1
- Conditions of the course acceptance/creditation:
- Test. Note.

* - depending on a system of studies