DESCRIPTION OF THE COURSES

- Course code: ELR 3309
- Course title: Electrometric electronic measurement systems.
- Language of the lecturer: polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*1*		*1*		
*Number of hours/semester**	*15*		*15*		
Form of the course completion	*colloquim*		*note*		
ECTS credits					
Total Student's Workload					

- Level of the course (basic/advanced):
- Prerequisites:
- Name, first name and degree of the lecturer/supervisor:
- Names, first names and degrees of the team's members:
- Year:..... Semester:.....
- Type of the course (obligatory/optional):
- Aims of the course (effects of the course):
- Form of the teaching (traditional/e-learning):
- 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, gigaohmometersss, microprocessor i/u and u/u convertors. Monitoring and long distance transmission of signal.
- Lecture:

Particular lectures contents	*Number of hours*
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.	*2*
3. Methods and equipment of ultra high resistance. Electronic megaohmmeters: ranges, accucacy.	*2*
4. Methods and equipment of measurement of electrostatic potentials and DC and low-frequency voltage without current loading. Electrometric amplifiers and volmeters: internal resistance and current.	*2*
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. Aplications 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/credition:

Test. Note.

* - depending on a system of studies