

## DESCRIPTION OF THE COURSES

- Course code: ELR1206
- Course title: Modern methods of materials testing
- 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>15</i>		<i>15</i>		
<i>Form of the course completion</i>	<i>written test</i>		<i>reports</i>		
<b><i>ECTS credits</i></b>	<i>1</i>		<i>1</i>		
<b><i>Total Student's Workload</i></b>	<i>30</i>		<i>30</i>		

- Level of the course (basic/advanced): advanced
- Prerequisites: Fundamentals of Material Engineering.
- Name, first name and degree of the lecturer/supervisor: Bożena Łowkis, Ph.D., B.Eng.
- Names, first names and degrees of the team's members:
  1. Michał Lisowski, prof., D.Sc., Ph.D.
  2. Edmund Motyl, D.Sc., Ph.D.
  3. Ryszard Kacprzyk, D.Sc., Ph.D.
- Year: ...I..... Semester: .....1.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): Ability of advanced measurement methods application to dielectric material properties determination. Acquiring of structural techniques used for material investigation.
- Form of the teaching (traditional/e-learning): traditional
- Course description:

Resistivity, electric permittivity, dielectric loss factor of solid and liquid dielectrics from standards point of view. Spectroscopy of dielectrics. Methods of time response. Measurements of electrostatic parameters. Thermally stimulated depolarisation. Thermal analysis. Electron microscopy. Material testing in infrared and ultraviolet light. Problems of accreditation process of research laboratories.

- Lecture:

Particular lectures contents	Number of hours
1. Introduction: scope, requirements. Problems of material testing standardization.	1
2. Volume and surface resistivity. Methods of measurements of dielectrics resistivity.	2
3. Complex electric permittivity. Equivalent circuits of loss dielectrics.	2
4. Standard methods of measurements of frequency and temperature characteristics of dielectrics.	1
5. Modern techniques of measurements of frequency and temperature	

characteristics of dielectrics.	2
6. Measurements and analysis of absorption and resorption curves.	1
7. Thermally stimulated depolarisation.	1
8. Charge measurements. Measurements of surface charge density.	1
9. Volume charge measurements; kinetics of charge decay.	1
10. Material testing in infrared and ultraviolet light. Thermal analysis.	2
Electron microscopy.	1
11. Written test.	

- Classes – the contents:

- Seminars – the contents:

- Laboratory – the contents:

1. Thermally stimulated depolarisation.

2. Measurements of electrostatic properties of dielectrics.

3. Electrical conductivity measurements of dielectrics.

4. Dielectric spectroscopy of materials.

5. Testing of ferroelectrics.

6. Material testing in infrared and ultraviolet light. Thermal analysis.

7. Electron microscopy.

Problems of accreditation process of research laboratories. Measurements in accredited testing laboratory.

- Project – the contents:

- Basic literature:

1. Chelkowski A.- Fizyka dielektryków, PWN, Warszawa, 1993

2. Hilczer B., Małecki J.- Elektrety i piezopolimery, PWN, Warszawa, 1992

3. Oleś A.- Metody doświadczalne fizyki ciała stałego, WNT, Warszawa, 1998

4. Coelho R.- Physics of dielectrics for the engineer, Elsevier, 1979

5. Inżynieria wysokich napięć w elektroenergetyce, Praca zbiorowa pod redakcją H. Mościckiej-Grzesiak, Wyd. Pol. Poznańskiej, Poznań, 1996

6. Lisowski M. - Pomiary rezystywności i przenikalności elektrycznej dielektryków stałych, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2004

- Additional literature:

Recent publications.

- Conditions of the course acceptance/creditation: Written test including lecture and laboratory items.

\* - depending on a system of studies