

## DESCRIPTION OF THE COURSES

- Course code: ELR1212
- Course title: APPLIED SUPERCONDUCTIVITY
- 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				
<i>Number of hours/semester*</i>	30				
<i>Form of the course completion</i>	<i>control work or exam</i>				
<b><i>ECTS credits</i></b>					
<b><i>Total Student's Workload</i></b>					

- Level of the course (basic/advanced): advanced
- Prerequisites: Basic Physics.
- Name, first name and degree of the lecturer/supervisor: Bolesław Mazurek, prof., Dsc, PhD.
- Names, first names and degrees of the team's members:
  1. Leszek Woźny, PhD
  2. Jan Ziaja, PhD
  3. Jerzy Rutkowski, PhD

• Year:.....I..... Semester:.....2.....

- Type of the course (obligatory/optional): optional

Aims of the course (effects of the course): Acquaintance of superconductivity phenomena and superconducting materials. Knowledge about properties of high

- Form of the teaching (traditional/e-learning): traditional

- Course description:

Development of superconductivity: zero resistance, the Meissner effect. The London Theory. The Ginzburg-Landau theory. Type II superconductivity. Superconducting materials. The mechanism of superconductivity. The BCS theory. High-field, high-current superconductivity. Superconductivity tunnelling. The Josephson's effect. Confirmation of the electron-phonon mechanism. High temperature superconductivity. Application to electric power system. Superconductive electro-magnetic propulsion ship. Superconductive magnetic energy storage. Superconducting magnets for magnetic resonance imaging. Perspective view.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. The basic properties of superconducting state	2
2. Review of the superconducting materials	2
3. Critical parameters, Meissner effect	2
4. Thermodynamics of superconducting state	2

5. Type I and II superconductors, intermediate state, mixed state	2
6. Magnetic properties of superconductors, magnetic hysteresis	2
7. Critical current in type II superconductors	2
8. Measurements of physical properties of superconducting materials	2
9. Theories of superconductivity	2
10. Thin and thick films of superconducting materials, technology and applications	2
11. Superconducting wires and cables	2
12. Superconducting magnets	2
13. Superconducting magnetic energy storage	2
14. Superconducting machines, superconducting electronic optics	2
15. Written test	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
- Project – the contents:
- Basic literature:
  1. A. C. Rose-Innes, E. H. Rhoderick, *Nadprzewodnictwo*, PWN, Warszawa 1973
  2. M. Cyrot, D. Pavuna, *Wstęp do nadprzewodnictwa*, PWN, Warszawa 1996
- Additional literature:
  1. R. P. Huebener, *Magnetics Flux Structures in Superconductors*, Springer-Verlag, Berlin 1979
  2. S. Smoliński, *Nadprzewodnictwo. Zastosowania*, WNT, Warszawa 1983
  3. J. Stankowski, B. Czyżak, *Nadprzewodnictwo*, WNT, Warszawa 1994
- Conditions of the course acceptance/creditation: Written test passed.

\* - depending on a system of studies