

## DESCRIPTION OF THE COURSES

- Course code: ELR1270
- Course title: Fundamentals of vacuum technique and cryogenic electrical engineering
- 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>w r i t t e n t e s t</i>		<i>r e p o r t s</i>		
<b>ECTS credits</b>					
<b>Total Student's Workload</b>					

- Level of the course (basic/advanced): advanced
- Prerequisites: Physics, electrotechnics.
- 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. Jan Ziaja, Ph.D.
  2. Jerzy Rutkowski, Ph.D.
  3. Leszek Woźny, Ph.D.
- Year:.....II.... Semester:.....3.....
- Type of the course (obligatory/optional): optional
- Aims of the course (effects of the course):

Acquaintance of phenomena connected with vacuum, methods of its production, measurement and application in technological processes. Knowledge about low temperature generation techniques. Measurement of material properties at low temperature.

- Form of the teaching (traditional/e-learning): traditional
- Course description: Vacuum and low temperatures in industrial processes. Molecular-kinetic gas theory. Gas flow through holes and pipes. Surface phenomena of solid materials. Vacuum generation. Vacuum measurements and leakage detection. Design and operating principles of vacuum devices. High voltage vacuum insulation of electric devices. Low temperature generation. Properties of dielectric materials at low temperature. Metal properties at low temperature, their resistivity, specific heat, heat conductivity. Thermal insulation. Measurements of low temperature.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Vacuum and low temperature in industrial processes.	1
2. Molecular-kinetic gas theory. Gas flow through holes and pipes. Surface phenomena of solid materials.	2
3. Diffusion, volume, sorptive and ionic pumps.	2

4. Vacuum measurements and leakage detection.	1
5. Design and operating principles of vacuum devices.	2
6. Low temperature generation and measurement.	2
7. Thermal insulation.	1

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:

Design and operating principles of vacuum devices, vacuum measurements, leakage detection. Electric discharge in rarefied gas and in vacuum. Methods of low temperature generation, measurement of low temperature. Resistivity of pure metals at low temperature, determination of electron mean free path in metals. Technology of manufacturing of superconducting materials. Measurements of superconductors critical parameters.

- Project – the contents:
- Basic literature:

1. J. Groszkowski, Technologia wysokiej próżni.
2. J. Groszkowski, Urządzenia próżniowe, WSiP Warszawa, 1981
3. A. Hałas, Zagadnienia próżni w nauce, technice i przemyśle, WNT Warszawa, 1980
4. A. Hałas, Technologia wysokiej próżni, PWN Warszawa, 1980
5. R. B. Scot, Technika niskich temperatur, WNT Warszawa, 1963
6. L. Michalski, K. Eckersdorf, Pomiary temperatury, WNT Warszawa, 1986

- Additional literature:

J. Stankowski, Wybrane zagadnienia z kriogeniki.

- Conditions of the course acceptance/creditation: Written test passed.

\* - depending on a system of studies