

## DESCRIPTION OF THE COURSES

- Course code: ELR1207
- Course title: Thermokinetics of electronic and electric devices.
- 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>	1	1			
<i>Number of hours/semester*</i>	15	15			
<i>Form of the course completion</i>	<i>Written test</i>	<i>S o l v i n g problems</i>			
<i>ECTS credits</i>	1	1			
<b>Total Student's Workload</b>	30	30			

- Level of the course (basic/advanced): advanced
- Prerequisites: Physics, Fundamentals of electrical engineering
- Name, first name and degree of the lecturer/supervisor: Bolesław Mazurek, professor, DSc, PhD
- Names, first names and degrees of the team's members:
  1. Anna Kisiel, PhD
  2. Jerzy Rutkowski, PhD
  3. Leszek Woźny, PhD
- Year:....I..... Semester:.....1.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): Understanding of heat transfer mechanisms in various electronic and electric devices. Acquaintance with effective cooling systems. Skills of heat transfer problem solving – selection of appropriate criterion, calculation of heat transfer parameters (heat flux density, heat transfer coefficient etc.)
- Form of the teaching (traditional/e-learning): traditional
- Course description: The role of heat transfer during electric devices operation. I and II thermodynamics law. Generalized work concept. Heat conduction. Radiation and natural convection. Forced heat transfer. Cooling with fluid evaporation. Heat pipes. Transient states. Methods of heat transfer measurements.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Introduction. Basic terms and definitions.	1
2. Heat conduction.	2
3. Radiation	2
4. Free convection	2
5. Air forced convection	2
6. Fluid forced convection	2
7. Application of thermoelectric phenomena to cooling of semiconductive devices	2

8. Cooling with application of phase changes systems	1
9. Cooling devices. Heat pipes.	1
10. Heat measurements methods	1

- Classes – the contents:

Tutorials will be connected with following problems solving : heat conduction in steady state, heat transfer during forced convection, phase change, radiation. Problems with heat sink selection to electronic systems. Some aspects of heat exchangers calculation.

- Seminars – the contents:

- Laboratory – the contents:

- Project – the contents:

- Basic literature:

1. Pelc T., Borczyński J., Odprowadzanie ciepła z przyrządów półprzewodnikowych, Wydawnictwa Komunikacji i Łączności, W-wa, 1986
2. Scott A. W. „Cooling of Electronic Equipment”.

- Additional literature:

1. Wiśniewski S., Wiśniewski T., Wymiana ciepła, WNT, 1994,
2. Furmański P., Domański R., Wymiana ciepła. Przykłady obliczeń i zadania, Oficyna Wydawnicza Politechniki Warszawskiej, 2002

- Conditions of the course acceptance/creditation: Successful written test completion.

\* - depending on a system of studies