COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of Electroheat [S1Eltech2>PE]

Course

Field of study
Electrical Engineering

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Przemysław Skrzypczak
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Lecturers

Prerequisites

Students beginning lectures and laboratory classes in this subject should have basic knowledge of mathematics, physics and electrical engineering acquired in earlier stages of their first-cycle studies - semesters 1 to 3. They should be able to effectively engage in self-study in a field related to their chosen field of study and should be able to plan and carry out simulations and measurements of basic quantities characteristic of electrical systems. The ability to present the results obtained in numerical and graphical form is also required. Students should be able to interpret the results obtained, determine measurement errors and draw the right conclusions. In addition, they should be aware of the need to expand their competences and be ready to work as part of a team.

Course objective

Providing students with knowledge about various commonly used electrothermal methods applicable in domestic electrothermics, as well as industrial electrothermics methods. Providing students with knowledge about methods and ways of heat transfer, parameters characterising various methods, and the relationship between material parameters and the possibility of heat energy transfer.

Course-related learning outcomes

Knowledge:
The student has knowledge of physics in the field of thermodynamics necessary to understand the basic physical phenomena occurring between heated elements and their environment. The student has knowledge, knows and understands electrothermal transformations occurring in electrical engineering and electrothermics, and has basic knowledge of the methods and ways of heat transfer.

Skills:
The student is able to use literature sources available in print and electronic form. The student is able to integrate the information obtained, assess its reliability, evaluate it and interpret it. The student has the ability to think independently and draw conclusions, as well as the ability to draw their own conclusions, formulate clear and correct sentences expressing opinions about observed phenomena, and formulate and justify opinions and discuss them. The student is able to use their knowledge when selecting measurement ranges: ammeters, voltmeters and wattmeters. The student is able to connect simple measurement systems based on electrical diagrams and without them. The student is able to record measurement results correctly with a specified accuracy.

Social competences:
The student understands that knowledge is essential for solving electrothermal problems and understands that knowledge of heat transfer is one of the most important aspects of designing any electrical system. The student understands that thermal limitations are the most important and determine the power of electrical and electronic devices. The student understands that technologies used to dissipate excess heat energy are constantly being developed, and therefore it is necessary to update their knowledge and professional competences. The student understands that, as a result of the thermal parameters of electrical equipment they specify, they are responsible for the joint task of ensuring the reliable operation of the designed and operated electrical equipment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during lectures - assessment of knowledge and skills demonstrated in a written test. Skills and knowledge acquired during laboratory exercises: assessment of knowledge and skills related to the completion of the exercise task, assessment of the report on the exercise performed. Additional points are awarded for activity during classes, in particular for:
- the ability to work as part of a team, practically carrying out a task in the laboratory,
- comments related to the improvement of teaching materials,
- aesthetic care in the preparation of reports and tasks as part of self-study.

Programme content

The subject matter of the classes concerns electrothermics in general, the generation and conversion of electrical energy into useful thermal energy. Electrothermal methods, the construction and operating principles of industrial and common-use electrothermal devices. The topics covered in the lectures are supported by laboratory classes during which students determine, among other things, the efficiency of heating batches using both industrial and common electrothermal devices.

Course topics

Lectures: Primary earth energies, energy transfer flows, energy balance. Electrothermal devices and methods, operating principles and classification. Electrothermal conversions, heat generation methods. Discussion of methods: direct and indirect resistance, induction, microwave, capacitive, ultrasonic and electrode. Comparison of flame and electrothermal methods of heat generation - useful energy and their economic aspects. Basic laws of thermokinetics. Economic evaluation of individual electrothermal methods.
Laboratory classes:
- determining the efficiency of various electrothermal devices and the power distribution in an electrothermal device,
- electrical and thermal parameters of heating elements during direct resistance heating,
- testing the temperature values and distribution of commonly used electrothermal devices,
- testing the temperature values and distribution of loads for capacitive and inductive heating,
- testing the thermometric characteristics of thermocouples,

- contact and non-contact temperature measurements.

Teaching methods

Teaching methods used:
Lectures:
- lectures with multimedia presentations (including drawings, photographs, animations, sound, films) supplemented with examples given on the board
- interactive lectures with questions posed to the group of students or to specific students,
- student activity during classes is taken into account when issuing the final grade,
- initiating discussion during the lecture,
- theory presented in close connection with practice and the current knowledge of students,
- taking into account various aspects of the issues presented, including economic ones
Laboratories:
- laboratories supplemented with multimedia presentations (photos, animations, charts),
- use of tools enabling students to complete tasks at home (custom software),
- computational experiments,
- teamwork.

Bibliography

Basic:
Grzbiela C., Łoziak W.: Zarys elektrotermii, SEP COSIW, Warszawa 2014
Hering M.: Podstawy elektrotermii. WNT, Warszawa 1998
Hauser J.: Elektrotechnika. Podstawy elektrotermii i techniki świetlnej. Wydawnictwo Politechniki Poznańskiej, Poznań 2006

Additional:
Michalski L., Eckersdorf K., Kucharski J.: Termometria. Przyrządy i pomiary. Wydawnictwo Politechniki Łódzkiej, Łódź 1998
Hauser J.: Podstawy elektrotermicznego przetwarzania energii, Zakład Wydawniczy K. Domke, Poznań 1996

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00